TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

FOR THE YEAR 1895.

VOLUME XI.,

CONTAINING

PART I. OF THE REPORT OF THE COMMITTEE ON HEALTH RESORTS

AND A

GENERAL INDEX OF VOLUMES I.-XI.

PHILADELPHIA:
PRINTED FOR THE ASSOCIATION.
1895

Copies may be had of the Secretary.

OFFICERS OF THE ASSOCIATION, 1895

President.

S. EDWIN SOLLY, M.D., Colorado Springs.

Vice-Presidents.

JOHN H. MUSSER, M.D., Philadelphia.
GLENTWORTH R. BUTLER, M.D., Brooklyn.

Secretary and Treasurer.

JAMES B. WALKER, M.D., Philadelphia.

Council.

ALFRED L. LOOMIS, M.D., New York.
FREDERICK I. KNIGHT, M.D., Boston.
WILLIS E. FORD, M.D., Utica.
ROLAND G. CURTIN, M.D., Philadelphia.
ISAAC HULL PLATT, M.D., Lakewood.

OFFICERS OF THE ASSOCIATION,
1896.

President.

JAMES B. WALKER, M.D., PHILADELPHIA.

Vice-Presidents.

CHARLES E. QUIMBY, M.D., NEW YORK.
JAMES A. HART, M.D., COLORADO SPRINGS.

Secretary and Treasurer.

GUY HINSDALE, M.D., PHILADELPHIA.

Council.

FREDERICK I. KNIGHT, M.D., BOSTON.
WILLIS E. FORD, M.D., UTICA.
ROLAND G. CURTIN, M.D., PHILADELPHIA.
ISAAC HULL PLATT, M.D., LAKEWOOD.
S. E. SOLLY, M.D., COLORADO SPRINGS.

Representatives to the Executive Committee of the Congress of American Physicians and Surgeons.

FREDERICK I. KNIGHT, M.D., BOSTON.
ROLAND G. CURTIN, M.D., PHILADELPHIA, *Alternate.*

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LIST OF OFFICERS.

Presidents.

Name.	Year.
A. L. Loomis	1884–5.
William Pepper	1886.
Frank Donaldson	1887.
A. L. Loomis	1888.
V. Y. Bowditch	1889.
Charles Denison	1890.
F. I. Knight	1891.
W. E. Ford	1892.
R. G. Curtin	1893.
A. H. Smith	1894.
S. E. Solly	1895.
J. B. Walker	1896.

Vice-Presidents.

F. I. Knight, W. H. Geddings	1884–5.
Frank Donaldson, Beverley Robinson	1886.
V. Y. Bowditch, R. G. Curtin	1887.
A. Y. P. Garnett, J. T. Whittaker	1888.
J. R. Leaming, E. T. Bruen	1889.
A. L. Gihon, H. B. Baker	1890.
E. L. Trudeau, T. S. Hopkins	1891.
E. Fletcher Ingalls, Beverley Robinson	1892.
A. H. Smith, E. O. Otis	1893.
I. Hull Platt, E. L. Trudeau	1894.
John H. Musser, G. R. Butler	1895.
Charles E. Quimby, James A. Hart	1896.

Secretaries and Treasurers.

James B. Walker	1884–95.
Guy Hinsdale	1895.

LIST OF MEMBERS, 1895.

HONORARY MEMBER.

ELECTED

1890. Stille, Alfred, Philadelphia.

ACTIVE MEMBERS.

1893. Abbott, A. C., Laboratory of Hygiene, Univ. of Penna., Philadelphia.
1888. Abbott, Griffith E., Bryn Mawr.
1890. Allen, Harrison, 1933 Chestnut Street, Philadelphia.
1889. Anders, J. M., 1603 Walnut Street, Philadelphia.
1890. Anderson, B. P., Colorado Springs, Col.
1890. Atkins, Francis H., Las Vegas, N. M.

1893. Babcock, R. H., Venetian Building, Chicago.
1885. Baker, Henry B., 726 Ottawa Street, Lansing, Mich.
1885. Bell, A. N., 291 Union Street, Brooklyn.
1884. Bosworth, F. H., 26 West 46th Street, New York.
1885. Bowditch, V. Y., 506 Beacon Street, Boston.
1895. Brandt, C. N., Hot Springs, Va.
1891. Brannan, John W., 11 West 12th Street, New York.
1894. Bridge, Norman, 34 Washington Street, Chicago.
1888. Brooks, Leroy J., Norwich, N. Y.
1890. Buckley, J. J., Missoula, Mont.
1886. Butler, G. R., 229 Gates Avenue, Brooklyn.
1895. Boardman, W. S., 6 Bowdoin Square, Boston.

1894. Chapin, Frederick W., Hot Springs, Va.
1887. Chapman, S. H., New Haven, Conn.
1894. Coleman, Thomas D., 563 Green Street, Augusta, Ga.
1889. Coolidge, A., Jr., 1 Exeter Street, Boston.
1885. Curtin, R. G., 20 South 18th Street, Philadelphia.

ELECTED

1892. Daland, Judson, 319 South 18th Street, Philadelphia.
1885. Daly, W. H., 135 Fifth Avenue, Pittsburg.
1890. Darlington, Thomas, Jr., King's Bridge, New York City.
1884. Denison, Charles, 823 14th Street, Denver.
1884. Didama, H. D., 112 South Salina Street, Syracuse, N. Y.
1890. Dodge, H. O., Boulder, Colorado.
1890. Donaldson, Charles P., Muskegon, Mich.

1892. Edwards, William F., San Diego, Cal.
1892. Elsner, H. L., 516 Prospect Avenue, Syracuse, N. Y.
1885. Eskridge, J. T., 204 Equitable Building, Denver, Col.

1887. Fisk, Samuel A., 37 18th Street, Denver, Col.
1885. Ford, Willis E., 266 Genesee Street, Utica, N. Y.
1885. French, Thomas R., 469 Clinton Avenue, Brooklyn.

1884. Garland, George M., 227 Newberry Street, Boston.
1886. Garnett, A. S., Hot Springs, Ark.
1892. Gibson, William M., 260 Genesee Street, Utica, N. Y.
1887. Gihon, A. L., U. S. N. (Retired), United Service Club, New York.
1884. Glasgow, W. C., 2847 Washington Avenue, St. Louis.
1893. Gray, Landon Carter, 6 East 49th Street, New York.
1891. Griffith, J. P. Crozer, 123 South 18th Street, Philadelphia.

1892. Hall, William H., Saratoga Springs, N. Y.
1893. Hance, I. H., Saranac Lake, N. Y.
1894. Harrington, Mark W., President, Washington University, Seattle, Wash.
1891. Hart, James A., Colorado Springs, Col.
1893. Hinsdale, Guy, 3943 Chestnut Street, Philadelphia.
1885. Hopkins, Thomas S., Thomasville, Ga.

1884. Ingals, E. Fletcher, 34 and 36 Washington Street, Chicago.

1889. Jacobi, A., 110 W. 34th Street, New York.
1888. Jayne, W. A., 217 McPhee Building, Denver, Col.
1886. Johnston, W. W., 1603 K Street, N. W., Washington.

ELECTED
1893. Judd, L. D., 3603 Powelton Avenue, Philadelphia.
1885. Kenworthy, C. J., Tryon, N. C.
1890. Kellogg, J. H., Battle Creek, Mich.
1884. Knight, Frederick I., 195 Beacon Street, Boston.

1887. Langmaid, S. W., 373 Boylston Street, Boston.
1890. Lincoln, R. P., 22 West 31st Street, N. Y.

1894. McGahan, C. F., Aiken, S. C.
1887. Mays, Thomas J., 1829 Spruce Street, Philadelphia.
1893. Mills, Charles K., 1909 Chestnut Street, Philadelphia.
1891. Moore, H. B., Colorado Springs, Col.
1889. Munro, John C., 173 Beacon Street, Boston.
1886. Musser, John H., 1917 Chestnut Street, Philadelphia.
1890. Mulhall, J. C., 3609 Lindell Avenue, St. Louis.

1895. Newton, R. C., 19 North Fullerton Avenue, Montclair, N. J.
1888. Nunn, Richard J., 119 York Street, Savannah.

1884. Orme, H. S., Box 1045, Los Angeles, Cal.
1888. Otis, E. O., 308 Commonwealth Avenue, Boston.

1887. Peale, A. C., 605 Twelfth St., N. W., Washington, D. C.
1884. Pepper, William, 1811 Spruce Street, Philadelphia.
1893. Peterson, Frederick, 60 West 50th Street, New York.
1895. Phillips, W. F. R., Weather Bureau, Washington, D. C.
1885. Platt, Isaac Hull, Lakewood, N. J.
1887. Platt, Walter, 802 Cathedral Street, Baltimore.

1891. Quimby, Charles E., 44 West 36th Street, New York.

1891. Ransom, C. C., 142 West 48th Street, New York (Richfield Springs).
1884. Reed, Boardman, Atlantic City, N. J.
1890. Reed, Jacob, Colorado Springs, Col.
1885. Rice, C. C., 115 East 18th Street, New York.
1893. Risley, S. D., 1722 Walnut Street, Philadelphia.
1884. Robinson, Beverley, 37 West 35th Street, New York.
1890. Robinson, W. D., 2112 Mt. Vernon Street, Philadelphia.

ELECTED

1892. Roe, John O., 28 North Clinton Street, Rochester, N. Y.
1890. Rogers, E. J. A., 222 Colfax Avenue, Denver, Col.
1889. Ruck, Karl von, Asheville, N. C.
1891. Ruedi, Carl, 1711 Grant Avenue, Denver, Col.

1884. Schauffler, E. W., 1221 Washington Street, Kansas City.
1884. Shurly, E. L., 25 Washington Avenue, Detroit, Mich.
1890. Smith, A. Alexander, 40 West 47th Street, New York.
1885. Smith, Andrew H., 22 East 42d Street, New York.
1887. Smith, Frank Fremont, St. Augustine, Fla., and Bar Harbor, Maine.
1887. Solly, S. E., Colorado Springs, Col.

1892. Taylor, H. Longstreet, 494 Endicott Arcade, St. Paul, Minn.
1887. Thomas, J. Carey, 228 Madison Avenue, Baltimore.
1885. Trudeau, E. L., Saranac Lake, New York.
1884. Tyndale, J. Hilgard, 91 Second Ave., New York City.

1884. Walker, James B., 1617 Green Street, Philadelphia.
1885. Ward, Samuel B., 135 North Pearl Street, Albany, N. Y.
1891. Watson, E. W., 131 North 20th Street, Philadelphia.
1885. Weber, Leonard, 25 West 46th Street, New York.
1885. Williams, H. F., 450 Classon Avenue, Brooklyn.
1884. Wilson, James C., 1437 Walnut Street, Philadelphia.

Total, 105 Members.

PAST MEMBERS.

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* Deceased.

HONORARY MEMBERS.

*1892. Bowditch, Henry Ingersoll, Boston.
*1890. Lombard, Henri Clermond, Geneva, Switzerland.

ACTIVE MEMBERS

*1884–85. Armor, S. G., Brooklyn.

1885–91. Barger, D. E., El Paso de Roblis, Cal.
1886–87. Bradley, Edward, New York.
*1884–88. Bruen, E. T., Philadelphia.

*1885–88. Cabell, J. L., Virginia.
1884–94. Camann, D. M., New York.
1888–92. Coan, T. M., New York.
1884–92. Cohen, J. Solis, Philadelphia.
1884–87. Coomes, M. F., Louisville.

1885–88. Dana, C. L., New York.
*1884–91. Donaldson, Frank, Baltimore.
1886–88. Donaldson, Frank, Jr., Baltimore.
1887–88. Dougan, D. H., Denver.

*1885. Elsberg, Louis, New York.

1890–91. Fisher, Walter E., San Francisco.
1889–91. Flick, L. F., Philadelphia.
*1884. Flint, Austin, Sr., New York.
1890–91. Foster, G. W., Salt Lake City.

*1884–88. Garnett, A. Y. P., Washington.
*1884–92. Geddings, W. H., Aiken.
1888–90. Guiteras, John, Philadelphia.

1887–95. Henry, F. P., Philadelphia.
*1889–92. Hodges, W. D., Boston.
*1892. Hooper, Franklin H., Boston.
*1884–87. Hudson, E. Darwin, New York.
1884–95. Hurd, E. P., Newburyport, Mass.
*1892–93. Hutchinson, W. F., Providence.

1885–88. Inglis, David, Detroit.

1890. Janeway, E. G., New York.
*1895. Jarvis, W. C., New York.
*1884–90. Johnson, Homer A., Chicago.
1884–91. Jones, Talbot, St. Paul.

*1885–93. Keating, John M., Philadelphia.
1884–87. Kinsman, D. N., Columbus, O.
*1884–89. Kretschmar, P. H., Brooklyn.

1887–89. Latimer, Thomas, Baltimore.
*1884–92. Leaming, James R., New York.
*1887–93. Levick, James J., Philadelphia.
*1885–94. Longwill, R. H., Sante Fé, N.M.
*1884–95. Loomis, A. L., New York.

1887–90. McDougal, W. D., San José, Cal.
1884. McSherry, Richard, Baltimore.
1884–85. Mason, A. L., Boston.
1886–95. Matthews, Washington, U. S. A.
1890. Millard, H. B., New York.
1884–87. Miller, H. V. M., Atlanta.
*1887–89. Morgan, E. C., Washington.

1886. Osler, William, Baltimore.

1885–92. Page, R. C. M., New York.
*1885–88. Palmer, A. B., Ann Arbor.
*1888–89. Parrish, Joseph, Burlington, N. J.

1885–91. Reed, R. Harvey, Mansfield, O.
1890–95. Robinson, John A., Chicago.
*1884–87. Rochester, Thomas F., Buffalo.
1888–91. Rohé, George H., Baltimore.
1887–89. Roosa, D. B. St. John, New York.

1884–92. Seiler, Carl, Philadelphia.
1884–91. Shattuck, F. C., Boston.
1885–88. Shirmer, G. P., New York.
*1892–94. Stone, W. C., Lakewood, N. J.
*1890–93. Storndart, A. C., Salt Lake City.

*1885–92. Van Bibber, W. C., Baltimore.
1884–91. Westbrook, B. F., Brooklyn.
1885–89. Whittaker, J. T., Cincinnati.
1887–91. Widney, J. P., Los Angeles, Cal.
1885–92. Williams, G. A., Sharon Springs, N. Y.
*1889–94. Wilson, H. M., Baltimore.
1890–91. Wroth, James H., Albuquerque.

CONSTITUTION AND BY-LAWS.

CONSTITUTION.

Article I.—Name.

This Society shall be known as the American Climatological Association.

Article II.—Object.

The object of this Association shall be the study of *Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs.*

Article III.—Membership.

Section 1.—This Association shall consist of *active* and *honorary* members, the latter not to exceed twenty-five (25).

Sec. 2.—Names of candidates for active membership, indorsed by *two* (2) active members, shall be sent to the Secretary at least thirty (30) days before the annual meeting. On approval of the Council, the applicant shall be balloted for at the annual meeting. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members.

Sec. 3.—The power of nominating honorary members shall be vested in the Council. The election shall be conducted in the same manner as that for active members. Honorary members shall enjoy all the privileges of active members, but shall not be allowed to hold any office, or cast any vote.

Sec. 4.—Any member of the Association absent from the meetings, in person or by contributed paper, for three (3) con-

secutive years, without sufficient cause, may be dropped from the list of members by vote of the Council.

Article IV.—Officers.

Section 1.—The officers of this Association shall consist of a *President*, two *Vice-Presidents*, a *Secretary and Treasurer*, who, with five other members, shall constitute the *Council* of the Association.

Sec. 2.—Nominations. The officers, including the Council, shall be nominated by a committee of five (5) members, which committee shall be nominated by the President at the first session of each annual meeting, and shall report at the business meeting.

Sec. 3.—Elections. The election of officers shall take place at the business meeting. A majority of votes cast shall constitute an election.

Sec. 4.—The President, Vice-Presidents, Secretary and Treasurer shall enter upon their duties at the close of the annual meeting at which they are elected, and shall hold office until the close of the next annual meeting, or until their successors are elected.

Sec. 5.—Members of the Council, other than the President, Vice-Presidents, Secretary and Treasurer, shall hold office for five (5) years.

Sec. 6.—Vacancies. Any vacancy occurring among the officers of the Association during the year may be filled by the Council.

Article V.—Duties of Officers.

President and Vice-Presidents.

The President and Vice-Presidents shall discharge the duties usually devolving upon such officers. The President shall be *ex-officio* Chairman of the Council.

Secretary and Treasurer.

As Secretary, he shall attend and keep a record of all the meetings of the Association and of the Council, of which latter

he shall be *ex-officio* Clerk. At each annual meeting he shall announce the names of all who have ceased to be members since the last report. He shall superintend the publication of the TRANSACTIONS, under the direction of the Council. He shall notify candidates of their election to membership. He shall send a preliminary notification of the annual meeting two (2) months previous thereto, and the programme for the annual meeting at least two (2) weeks previous to its assembly, to all the members of the Association. He shall also send notification of the meetings of the Council to the members thereof. At each annual meeting of the Association he shall read the minutes of the previous meeting and of all the meetings of the Council that have been held during the current year.

As Treasurer, he shall receive all moneys due, and pay all debts therewith. He shall render an account thereof at the annual meeting, at which time an auditing committee shall be appointed to report.

ARTICLE VI.—COUNCIL.

The Council shall meet as often as the interests of the Association may require.

Four (4) members shall constitute a quorum.

It shall have the management of the affairs of the Association, subject to the action of the Association at its annual meetings.

It shall consider the claims of candidates recommended to it for admission to membership.

It shall not have the power to make the Association liable for any debts exceeding in total one hundred dollars ($100), in the course of any one year, unless specially authorized by a vote of the Association.

It shall have the entire control of the publications of the Association, with the power to reject such papers or discussions as it may deem best.

It shall have power to nominate active members at the annual meeting.

The Council shall have power to invite any gentleman, not a member, to read a paper at the annual meeting, on any subject within the scope of the objects of this Association.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and By-Laws, or for unbecoming conduct, and shall have the sole power of moving the expulsion of any member.

The President, or any two members, may call a meeting, notice of which shall be transmitted to every member two (2) weeks previous to the meeting.

Article VII.—Papers.

Section 1.—The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than one (1) month before the first day of the meeting, in order to appear on the printed programme.

Sec. 2.—No paper shall be read before the Association which has already been printed or been read before another body.

Article VIII.—Quorum.

A Quorum for business purposes shall be ten (10) members.

Article IX.—Amendments.

This Constitution may be amended by a four-fifths ($\frac{4}{5}$) vote of all the members present at an annual meeting, provided that notice of the proposed amendment has been printed in the notification of the meeting at which the vote is to be taken.

BY-LAWS.

1. Meetings of the Association shall be held annually.
2. The time and place of the meetings shall be determined by the Council.
3. The dues of active members shall consist of an annual assessment not to exceed five ($5) dollars. Members in arrears shall not be entitled to vote. Those in arrears for two (2) years

may be dropped from membership by recommendation of the Council.

4. Order of business meeting.

First day:

Calling the roll of members.
Minutes of previous meeting.
Treasurer's report.
Appointment of auditing committee.
Appointment of nominating committee.
Report of Council on recommendations for membership.
Election of members.

Second day—Morning session.

Report of nominating committee.
Election of officers.
Report of the committee on health resorts.
Miscellaneous business.
Adjournment of business meeting.

Any of these By-Laws may be amended, repealed, or suspended by a two-thirds vote of the members present at any meeting.

MINUTES OF BUSINESS MEETING.

The Twelfth Annual Session of the American Climatological Association was held June 13 and 14, 1895, at Hot Springs, Virginia Dr. S. E. Solly, President, presided.

The following members were present:

Dr. Babcock,	Dr. Mulhall,
" Brandt,	" Newton,
" Chapin,	" Otis,
" Coleman,	" Phillips,
" Curtin,	" Peale,
" Daland,	" I. H. Platt,
" Darlington,	" Quimby,
" Hinsdale,	" Beverley Robinson,
" Hart,	" W. D. Robinson,
" Knight,	" Solly,
" Langmaid,	" Taylor,
" McGahan,	" Walker.

Guests: Dr. E. L. Bernardy and Dr. T. C. Ely.

The minutes of the last meeting were presented by the Secretary, Dr. J. B. Walker, and approved by the Association.

The report of the Treasurer, Dr. Walker, was read. The President appointed an Auditing Committee, consisting of Drs. Mulhall and Hart.

The Council recommended the election of the following gentlemen:

Dr. William S. Boardman, Boston.
" W. F. R. Phillips, Weather Bureau, Washington, D. C.
" Richard C. Newton, Montclair, N. J.
" C. N. Brandt, Virginia Hot Springs, Va.

By vote of the Association, the Secretary was instructed to cast the ballot electing the above named.

The Council also reported the following resignations:

Drs. E. P. Hurd, Frederick P. Henry, Washington Matthews.

On motion of Dr. Darlington, the report of the Council, embodying also the suggestion to meet at Lakewood, N. J., in May, 1896, was adopted.

On recommendation of the Council, the Association elected Dr. Frederick I. Knight, of Boston, Representative to the Executive Committee of the Congress of American Physicians and Surgeons, and Dr. R. G. Curtin, of Philadelphia, Alternate.

The Secretary read letters from Dr. Bowditch and other members, expressing their regret at being unable to attend the meeting.

New Business. After a short discussion of the question of publication, a motion was adopted allowing members to publish their papers in whatever journals they desire, furnishing reprints to the Association for publication in the TRANSACTIONS, and also reprints of any tables accompanying the papers.

The following resolution, offered by Dr. Frederick I. Knight, was unanimously adopted:

"WHEREAS, Since tuberculosis has been demonstrated to be a communicable disease, it has become doubly desirable that hospitals for the reception of the poor afflicted with this disease should be established,

"*Resolved*, That the American Climatological Association recommend the establishment of such hospitals in every State, not only for the relief of the great suffering attending this disease among the poor, but also as a protection of the community against its spread."

Dr. C. E. Quimby, Chairman of the committee appointed to submit a resolution with regard to the late Dr. Alfred L. Loomis, reported as follows:

Gentlemen of the American Climatological Association:

"Duty and established custom make it fitting that in formal manner your Committee report to this Association the death, upon January 23, 1895, of our former President and member, Alfred L. Loomis, M.D., LL.D. Love and respect make it imperative that in so doing we dwell for a moment upon the many ties which united us, and make some record by which his many and varied gifts and qualities which have enriched us may

be made a powerful influence upon those who are to continue this Association.

"Dr. Loomis was born in Bennington, Vt., in 1831. His early education was largely under private tutors at Woodstock, Vt., while his academic degree was taken at Union College. After graduation, in 1852, at the College of Physicians and Surgeons, he served the usual term in Bellevue Hospital. Very soon after starting in private practice he was appointed visiting physician to the same hospital, where he continued in active duty until the day of his final illness. For more than thirty years Dr. Loomis held the chair of Pathology and Practice in the Medical Department of the University of the City of New York, and to his energy and wise efforts, more than to any one other force, may be attributed the growth and prosperity of that institution.

"In his professional life Dr. Loomis was pre-eminently an active, energetic, sagacious physician. In all his relations to medicine and medical progress he was conservatively but uniformly progressive; never assuming an advanced position until fully, or even superfluously, convinced of its accuracy, he was unfaltering in its defence. A similar faith in the eventual success of truth made him unable even to consider the possibility of failure in any purpose once undertaken.

"Dr. Loomis was one of the faithful band who originated this Association, and we all well know how faithfully he worked for its advancement and success. He was its first President, and was again its President during the first Congress of American Physicians and Surgeons, in Washington, assembled, and, as our delegate, was elected the President of the third Congress. At one time efforts to merge the American Climatological Association into another national organization threatened to destroy it. Dr. Loomis arose in his might and courage and averted the danger, if such existed.

"Dr. Loomis had a most enviable reputation, not only in his professional but also in his private life.

"He was a frequent contributor to the Proceedings of this Association.

"In expressing our sense of personal, as well as united, loss in the death of Dr. Loomis, we realize that we can do him no greater

honor than to present this record of his work for a perpetual stimulus to members of this Association."

On motion by Dr. Frederick I. Knight, the resolution was adopted, and the Secretary instructed to send a copy to the family of Dr. Loomis and to file a copy in the Proceedings of the Society.

The Committee on Nominations, consisting of Drs. Knight, Beverley Robinson, Langmaid, McGahan, reported the following list of officers:

President—Dr. James B. Walker, Philadelphia.

Vice-Presidents—Dr. C. E. Quimby, New York, and Dr. James A. Hart, Colorado Springs.

Secretary and Treasurer—Dr. Guy Hinsdale, Philadelphia.

The above report was unanimously adopted, and these officers were duly elected.

The Auditing Committee reported that they had examined the Treasurer's report and found the same correct.

The Committee on Health Resorts, through its Secretary, presented its report, which is printed in full in the present volume (see Appendix). The Committee was constituted as follows: Dr. V. Y. Bowditch, Chairman; Drs. I. H. Platt, S. A. Fisk, Karl von Ruck, E. O. Otis, Secretary. On motion, Dr. A. C. Peale was added to this committee for the ensuing year.

In discussing the report, Dr. R. H. Babcock said: As a member of the Association, I should like to have data furnished by the Committee with regard to resorts suitable for cardiac patients. It has been quite a question with me many times to decide where to send patients with heart disease. I should like information concerning the interior of Florida and Georgia particularly, and to learn of places which are not frequented by tuberculous patients. I do not like to send patients with heart disease where tuberculous cases abound. It seems as if the attention of physicians has been given to the great army of consumptives, to the apparent neglect of that large contingent of other patients who require removal to a salubrious climate.

Dr. Frederick I. Knight said: I think this is a valuable work of our Committee, and I hope it is not in their minds to wait to complete it before publication. I hope this will appear as a preliminary report, a precursor of other things to come.

This can appear in our report and in reprints. We ought to go ahead and publish this and continue the Committee, asking them to go on with their work, including especially, as some gentleman has suggested, seashore places, for information in regard to which we have very great need; for the Society deals not only with tuberculous patients, but with patients of all kinds.

Dr. Charles E. Quimby moved that the report be accepted, and that the Committee be instructed to publish these reports in such manner as they deem best; and that the Committee be continued for the following year. Carried.

The Association passed a vote of thanks to the Chesapeake and Ohio Railway Company, to the Virginia Springs Hotel Company, and to Drs. Chapin and Brandt for their extreme hospitality.

On motion of Dr. Knight, a vote of thanks was passed to Dr. Solly, in recognition of his services as presiding officer during the current year.

On motion, the business meeting adjourned.

The visit to Hot Springs gave the Association the opportunity to see the famous Warm Springs and the Healing Springs. At the latter place the Association had its supper, in which thirty-three members and ladies participated.

On the following day, by the courtesy of Mr. H. W. Fuller, General Passenger Agent of the Chesapeake and Ohio Railway, the Association visited the Natural Bridge of Virginia and other points of interest.

The President, Dr. Solly, prefaced his address by congratulating the Association upon the good attendance of members, both as to quality and quantity, and in the choice of such a beautiful and pleasant place for assembling; but he expressed the feeling of our members that our happiness was sadly overshadowed by the consciousness of the loss of our most distinguished leader, champion, and friend, Dr. Alfred L. Loomis, whose premature death, while a misfortune and regret to the whole profession, was peculiarly so to our Association. Personally, the President had lost a kind friend and adviser. While much of the good work he had done would live after him, yet it is very sad to think that we should never see his face again.

PRESIDENTIAL ADDRESS.

THE PRINCIPLES OF MEDICAL CLIMATOLOGY.

By S. E. SOLLY, M.D.,
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In presenting to you some thoughts upon medical climatology and its underlying principles I am mindful that while the profession as a whole are lamentably ignorant of the principles of climatology, and sadly careless and ignorant in their application, and need instruction in the very grammar of the subject, I have now the honor of addressing those whose reputation and presence here are assurances of their knowledge and serious interest in climatic study. I shall therefore, as far as possible, avoid dwelling upon well-known facts, but it would seem wise to first define the subject we are to consider.

Climate implies the physical peculiarities of a given locality, while climatology is the study of these various climates with their special correspondences and their effects upon man.

Medical climatology, in the arrangements of its various departments, may be compared to a pyramid, the broad base of which is formed of the study of climatic physics, which include the essence of meteorology and certain portions of geography, geology, botany, and zoölogy. Resting upon this physical foundation is the tier, formed of the physiologic effects of climate, this being the study of the influence of the various physical elements of climate separately, first, and then in combination, upon the natural human being, the first consideration being the influence upon special organs and functions, and then upon the human organism as a whole. When

this point is arrived at we reach the next department or tier in our pyramid, where inquiry leads to the distinctions of race; how they have been located and modified by special climates, first in their physiologic peculiarities and next in their pathologic, so that we have placed upon the layer of physiology one of ethnology, and upon this, again, a tier of geographical pathology. By the latter we are taught the special tendencies and dangers of each climate. Next, the classificaticn of climates followed by the study of special climates and localities should claim our attention.

We have at length arrived at a sufficient elevation on our pyramid of knowledge to undertake the building up of the apex of our structure with climatic therapeutics, beginning with a tier composed of general climato-therapy, that is, a consideration of what diseases and what stages and forms of them are likely to be benefited by any climatic change. Next, the particular climates suited for the special diseases. Then the study of the influence of climate upon the various temperaments and diatheses and, finally, the point is reached of the individual case and its appropriate climatic treatment.

Thus, climatology is based upon:

1. Physics.
2. Physiology.
3. Ethnology.
4. Geographical pathology.
5. Classification of climates.
6. Special climates.
7. General climato-therapy.
8. Individual climato-therapy.
9. The individual case and its appropriate climate.

Under the head of physics we find certain matters connected with meteorology, worthy of emphasis and consideration. The meteorology of a given locality is broadly divided between the general meteorology of the hemisphere, State and latitude, and the local. General meteorology is being developed most efficiently by the Government Weather Bureau, and we must do all we can to aid them, especially in their new department

of medical climatology, in which by collecting the necessary morbidity and mortality statistics from all parts of the country, the relations of sickness and death to the state of the general weather will be made apparent; and in time, perhaps, warning may be given to the delicate, as it now is to mariners and farmers.

The comparison of the general weather and its results with that of special localities and their health will serve to show how the general weather of a given week is modified or intensified by local conditions. In local weather reports it behooves us to urge the stating of them more fully, especially with regard to humidity, sunshine, and wind, and a separation of reports into seasons, and again, a showing of what I have termed, in reporting upon Colorado Springs weather, as an *invalid's day;* that is, the average state of the weather during the hours the invalid can and shonld be out. While night air that is not too damp or chilling to permit of open windows is desirable, especially on account of its purity, yet the influence of the night climate when injurious can be much more easily modified than that of the day, and should be considered separately.

Under the head of physical conditions there is one point that is far too infrequently reported, and too little dwelt upon by the physicians of this country—the soil; whereas, in Europe, experience and the teachings of science have made it one of the prime factors in judging of a health resort, although a distinguished American physician, the late Henry I. Bowditch, was the first to study and demonstrate the importance of considering the soil in selecting a residence, which has been since abundantly confirmed by the labors of others. It is not only the material of which the soil is composed that must be considered, but also its natural drainage and the disposition of its watershed. The importance of this consideration, while we all present here admit, perhaps we do not sufficiently dwell upon to our clients and our colleagues; often do we find a town in a health-giving air with good surrounding soil, yet situated in a river bottom, recommended for

invalids; or a flourishing health resort under benignant skies, built upon a clay bed or in a basin which cannot drain.

Again, while the meteorology of a place is of great importance *per se*, it is very much more so in connection with the other conditions, such as elevation, aspect, shelter, and soil, as these together make climate; the other alone only weather, and, paradoxical as it may appear, it sometimes happens that the climate continues good even when the weather is temporarily bad.

There is another point that is worth remembering that the pleasantest climate to the invalid is not always the best for him. While to come "unto a land where it was always afternoon" is well suited for some, others fare better where the cry of "Cease, rude Boreas," is often heard. Thus, while a sedative climate is frequently called for, a tonic one is still more often needed. Remember, all our climatic prescriptions cannot be sugar-coated.

Passing now to the study of physiology in connection with climatic therapeutics, we see a field white for the harvest, and it is only from the corn gathered in this field that the bread of knowledge can be made which is alone worthy to be served on the table of the climatologist. But, alas, to produce good physiologic work, time and money are the first requisites, in neither of which do we as a profession abound. There is a crying need for well-trained and well-paid physiologists in well-equipped laboratories in all the chief sanitaria of the world, and it is only by placing the knowledge gained through them freely before the therapeutist that our branch of medicine can advance from the present gloom of fiction and tradition, which now is but faintly illumined with a few isolated facts, and from which the health-seeker endeavors to emerge, guided more often by the rush-light of empiricism, or led astray by the will-o'-the-wisp of false theory, than by the lamp of science. Some of these lines of investigation are a fuller study of the influence of sunlight and sunheat upon physiologic and pathologic conditions, and some good work has lately been done in their effects upon bacteria. This work

could be carried on most efficiently in climates where sunlight was most brilliant. The influence of atmospheric electricity and the influence of humidity with both high and low temperature also needs study.

Further experiments are needed upon the effects of diminished barometric pressure; while excellent work has been done by Paul Bert, Muntz, Regnard, Viault, Egger, Woolff, and Koeppe, in which the blood changes have been noted, yet they need carrying on further, and particularly by physiologists resident in high altitudes, so that it can be demonstrated clearly what are the permanent and what the transitory effects. These investigations have gone far to make it probable that the blood changes, such as the increase of red corpuscles and hæmoglobin, are the reason for the undoubted clinical fact that altitude is, *per se*, the most valuable climatic factor in combating the progress of tuberculosis. While this can be reasonably inferred it is not yet absolutely proved.

It should also be demonstrated what are the blood changes, if any, brought about by residence upon the ocean or sea-islands, as similar results upon tuberculosis to those in mountain air are sometimes brought about. The effects of sea and mountain air upon the nervous system need much elucidating. Again, the influence of atmospheric electricity upon the human organism stands ready for explanation.

To you I need scarcely enumerate the many branches of study that require more extended work by the climatic physiologist to make way for the pathologist, with the therapeutist in his wake. While we ask for more workers and more means we must not be unmindful of those who have already entered into and are still laboring skilfully and manfully in this field.

In ethnology much good work has been done, but we need the collaboration of the ethnologist with the climatologist, so that the lessons ethnology can teach us of climatic influence, especially in transplanted races, extending over long periods of time, can be applied to the elucidation of the more immediate effects of climatic changes upon individuals in the present.

In geographical pathology the volumes of Hirsch stand out as a monument of systematic, elaborate, and successful research in this field, while the work of Davidson and studies such as those of Matthews on the North American Indians, have added much to this department of climatology.

Passing on to the classification of climate, we are confronted with one of the greatest stumbling-blocks in the way of placing climatology upon a really scientific basis. The interlacing and interdependence of the various factors which go to make climate and the modifications of their relative and combined influences by seasons, by local conditions, and also by remote influences, make it wellnigh impossible to formulate any classification of climates that is not imperfect and open to many objections. Therefore at present, at least, this cannot be accomplished with scientific accuracy, but only in a broad and general way.

The geographical divisions of climate are comparatively easy, as into sea and land; the former with its subdivisions of ocean, island, and coast, and the latter with its divisions by elevation, and again, a classification by position to the equator is not difficult. But it is when we come to classify the whole by important meteorological conditions that we find the serious difficulties. What do we mean by a dry, or what by a damp climate? Of course, when we think of extreme instances we know what we mean. But where are we to draw the line, and are we to judge by the absolute amount of moisture in each cubic foot of air for comparison, or by this in relation to the temperature. Is it the absolute or the relative humidity reached, or both together, which determines the class in which the climate is to be placed? The meteorologists themselves are not yet prepared to clearly explain this question. though work is going on among them which will assist in clearing off the fog hanging over it. Of this nature is the work of Professor Harrington upon what he very happily terms "sensible temperatures." The amount of evaporation from the skin is regulated by the amount of watery vapor present in the air, that is its humidity, and the greater and

more rapid the evaporation from the skin, the greater the coolness of its surface, so the cooled blood of the cutaneous vessels carried into the circulation aids in preventing the general body-heat rising above normal. Thus we see the value of recording the temperature of the wet, as well as the dry, bulb of the thermometer. This is an interesting subject to pursue into its therapeutic aspect, but *verbum sapienti.*

Passing to the tier composed of special climates, I will merely say that in my opinion too little consideration is shown to the circumstances of the particular place as regards food, lodging, work, and amusements. So often, while the general climatic conditions are favorable, yet after all, the sending of that particular patient to that particular place is a failure; it is a case of a round man in a square hole, or *vice versa,* and while the disease may have been placed in the appropriate climate the individual has not. As Julius Braun said so admirably in his classic work on *Baths and Health Resorts:* "You have to consider not only the individual sickness, but the sick individual in climatic therapeutics." There is much to be said, from which the clock's warning face bids me refrain, but do let us remember the advice I heard Frank Buckland, the naturalist, once give: "When you get hold of a fact pin it down for future use." When found make a note of it. It is the slow accumulation of these, brought together by many hands, in many lands, which will ultimately give us a scientific climato-therapy. In the recording of cases of phthisis treated by climate, especially as to results, the history must be sought and reported over long periods to be of real value, and I know full well this entails much labor and can, with the best endeavors, be only followed in a few out of many cases that are seen.

It is not the results of any one man or place that are of so much value as their use with many others; their family likenesses as it were, are brought out and one report aids and corrects the other. Again, for comparison, do let us receive more facts concerning the natural history of phthisis as seen by city physicians, where no climatic change could be noted.

Sometimes we congratulate ourselves that while a case of phthisis did not recover, yet it lived for some time, say for fifteen years, and think that here, at least, we see the retarding effects of a certain climate; but, turning to the pages of such careful observers as Flint, we are led to doubt this special influence when we find similar cases recorded living as long without using such climates.

I must now cease giving you these scattered suggestions concerning the principles of climatology, and close this brief review of the general subject, to make way for the more important discussion of its various branches, of which the programme with its names of authors promises us a rich feast. This is a gathering where the men of the sea, of the plain, of the mountain, of the city, and hamlet are drawn from their homes, in many cases hundreds of miles apart, to study and advance the science of climatology.

THE INFLUENCE OF HEREDITY UPON THE PROGRESS OF PHTHISIS.

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The subject of the influence of heredity upon pulmonary phthisis has often been discussed, and Reginald Thompson, Pollock, Williams, and others have by their careful analysis of a large number of cases demonstrated the main facts in the natural history of phthisis, in which family predisposition was exhibited. It would, therefore, appear unlikely that I could add anything material to the facts already ascertained, and certainly the number of my cases (250) are insufficient to prove anything new in this matter, and can only be taken as suggestive. The fact, however, that these cases were all treated in Colorado Springs at an altitude of 6000 feet gives them a somewhat different color and interest to the work already reported, which was mostly from hospital cases which were a comparatively short time under observation, and in climates unfavorable to prolonged life, or where private cases sent for the most part to various health resorts, and their course and often termination were under the observation of physicians other than the reporter, so that the results are probably not as accurate as they might be; these cases, on the other hand, were all under the personal observation and care of the reporter during most of their illness, and many of them after their convalescence. They were not selected, except that only those were taken whose cases could be followed up and their progress and the results positively verified, and, in order to do so the better, no cases were taken who were

seen for the first time less than two years ago. With these limitations, 250 cases of phthisis are all to report on at the present time, for, though a much larger number of consumptives have been seen and treated during the same period, yet comparatively few of the cases can be traced so as to speak accurately and positively of results. Though it would undoubtedly have been better if the cases were continuous and covered all that were seen, yet, as they are widely scattered over sixteen years of practice, they doubtless fairly represent the whole number, and that they are of average material is shown by the comparison of their general features with the statistics referred to, and as to the results, with the high altitude reports of others, which latter comparison exhibits a strong family resemblance in all the series of reports.

The title of this paper is "The Influence of Heredity upon the Progress of Phthisis;" whereas, perhaps the word heredity should be exchanged for one embracing more, viz., "family phthisis."

Family phthisis may be mainly divided, first, into *parental*, where one or both parents had phthisis or tuberculosis;[1] second, *grandparental*, where atavism is shown by one or more of the grandparents being tainted and the intervening parents free; and, third, *collateral*, where uncles and aunts, sisters, and brothers were affected.

There are apparently three ways in which the family may affect the development of phthisis, viz.: First, by direct transmission of the bacilli in procreation; second, by inheritance of a physique peculiarly susceptible to phthisis; third, by contagion from living with consumptive relatives or in their dwellings.

1. INHERITANCE OF BACILLI.—That the bacilli themselves can be transmitted has been abundantly proved by several observers. The recent work of Whitridge Williams, of the Johns Hopkins University,[2] shows this in the human being.

[1] These terms are used as equivalent; the cases of phthisis in which tuberculosis is not present are too rare to affect the questions here discussed.

[2] The Johns Hopkins Hospital Reports, vol. iii., Nos. 1, 2, and 3.

Whitridge Williams states that a series of systematic examinations have been made of all pathological specimens pertaining to the diseases of women which have come within their reach during the past few years, the material being derived from the operating as well as the autopsy table. He writes that "among other things it has served to demonstrate that tuberculosis of the female generative organs is of far more frequent occurrence than is generally supposed, and that instead of being merely a pathological curiosity it should be regarded as a disease of practical interest and importance." These reports indicate clearly the way in which tuberculosis is transmitted from the tuberculous mother to the fœtus, and how tuberculosis may be limited in the mother to the genital organs without disease elsewhere, and serve to explain how a tuberculous father may beget a tuberculous child without there being other than genital tuberculosis of the mother.

The evidence upon this subject is well set forth in a valuable article by the late Dr. John M. Keating,[1] entitled "The Plausibility of the Direct Transmission of Tuberculosis from Either Parent." My own clinical experience agrees with these opinions. I have known instances where the consumptive father died before or soon after the birth of his child, and where the element of contagion must be eliminated, knowing the habits of the family, the child subsequently developing a tuberculosis and the mother remaining apparently quite healthy. The direct transmission of bacilli from the mother to the fœtus has been proved by Birch-Hirschfeld and others, and several authentic cases were recited at the last Paris Congress of Tuberculosis

The experiments of Hericourt and Richet upon dogs, and those of Gertner, have demonstrated the same facts with regard to animals.

Gertner gives the following summary of his article:[2] "The *résumé* of the whole series of experiments in a few words is as follows:

[1] Archives of Pediatrics, September, 1893.

[2] Zeitschrift für Hygiene und infect. Koch and Fluege; No. 2, vol. B. p. 93.

"Among the animals upon which experiments were made were mice, canary birds, and rabbits.

"As a result of the experiments which I have selected, I find that very often tubercle bacilli are transmitted from mother to offspring. To draw a conclusion from these experiments on animals and apply it to man is a matter which must be left to everyone's judgment.

"As these experiments have shown me a frequent transmission of tubercle bacilli from mother to offspring among the species I have chosen, and as statistics show that mortality from tuberculosis in man is greatest during the first year of his life, as also the disease is a chronic one, and the infection takes place at a relatively late fœtal period, and at birth tuberculosis cannot be expected to show itself, I assume, contrary to my former view, that with man, also, the tubercle bacillus is often transmitted from mother to child.

"The experiments with rabbits and guinea-pigs have shown nothing which would indicate the transferrence from father to offspring.

"Where tubercle bacilli were found in considerable number in the semen, infected offspring did not follow, but rather an infection of the mother occurred.

"If here I also draw a conclusion from the experiments on animals for man, it will be that in man also tuberculosis is not transferred by the copulative act from the father to the child. This is proven by the numerical ratio between spermatozoa and tubercle bacilli, even where the animal is especially susceptible to tuberculosis, there is only one bacillus to from 14 to 140 million, 1 : 14,000,000 or 1 : 140,000,000 spermatozoon in the semen. Also by the rarity of primary genital tuberculosis in the female and the mechanical impossibility of an inert, motionless tubercle bacillus attaching itself to a lively, wriggling spermatozoon."

That the bacilli can be transmitted not only from the parents, but also occasionally from the grandparents is very probable. The revelations of autopsies which show tuberculosis of glands, etc., in persons who were believed to have had

no evident tuberculosis, and who died from other causes, and the probability of many of the surgical tuberculoses of children being due to latent bacilli, which gave rise to no symptoms until a traumatism furnished the inflammatory products for the bacilli to feed upon, to again retire into innocuous desuetude with the rest given by splints, etc., to the inflamed parts, renders it almost, if not quite, certain that bacillary infection may be transmitted through a silent generation. Dr. Keating's article furnishes also good evidence for this belief.

2. Inheritance of Susceptibility.—In the collateral cases the question of the direct transmission of the disease of course does not enter. We have, therefore, for these cases to look for other explanation of the undoubted connection and influence of collateral family predisposition upon the development of phthisis.

This relation is perhaps most often to be accounted for through the second channel through which the family may influence phthisis; that is, through the inheritance of a physique peculiarly susceptible to bacillary infection, or to the development of tuberculosis when once engrafted, or to both, and this inherited susceptibility may be that of a general deficiency or lack of power of resistance, or of a more special character, whereby the bacilli readily find entrance and are easily conveyed from one part to another, or the physique is perhaps more often one in which both of these conditions prevail; thus this tendency may be inherited through parents who are silent, not having been exposed to sufficiently trying conditions to develop the disease, or because the influence of one parent was antagonistic; whereas, in the offspring circumstances favored the reception and growth of the disease, or the influence of the other parent was toward increasing the susceptibility. While it may be considered highly improbable that more than a very few of the cases with collateral taint inherited the bacilli from parents who showed no disease themselves, yet, on the other hand, it is very probable that among those with parental or grandparental predisposition there are many in whom there was no transmission of bacilli,

but only of physique. This would seem most likely when the family predisposition was paternal.

3. Family Contagion.—We must now consider the question of contagion. This, as far as we know, means reception of the disease by inhalation. That children breathing the air of rooms in which their consumptive parents, brothers, sisters, uncles, or aunts were living or had lived, could inhale the dried sputum in the form of light dust, and so become inoculated with the bacilli, is unqestionably true, and no doubt a certain proportion of the cases of family phthisis can be accounted for in this way.

That a large number of so-called hereditary cases were not exposed to the dangers of family contagion is obvious, such as those whose consumptive relations with whom they lived died too long before the onset of their own symptoms to make it probable that they could have communicated the disease personally or through the dwelling. Again, many were never in connection with the previous case, either personally or through other media. At a meeting of the New York Academy of Medicine, held January 21, 1892, there was a discussion on the prevention of tuberculosis, which brought out some very interesting statements and facts. From among them I quote a portion of the remarks of Dr. D. C. G. Currier as pertinent to the question: "Although the temptation is ever present to use a 'royal road' for learning about the origin of the disease, and by assuming the inhalation theory as explaining all cases, and considering other explanations as unwarrantable, it must be insisted that the inhalation theory accounts for only a portion of the cases, and that, after all, heredity seems a very potent source, as evidenced by the common-sense experience of clinicians and statistical observers, as well as by bacteriologists of the highest standing, such as Prof. Baumgarten and others, who are thoroughly conversant with the exclusive literature of the subject and acquainted with all the progress and changes of the decade. An infant seems quite as liable to inhale the bacteria of desiccated sputum as an adult is, and then to develop tuberculosis of the

lungs, if the inhalation theory is adequate to account for all cases; but we have the clinical fact presented us that the lungs do not develop tuberculosis in infants as often as in adult life, yet the glands, bones, and joints are relatively very often affected without any evidence that the infection arose primarily in the subject through inhalation of bacteria. These considerations, together with the occurrence of cases of fœtal tuberculosis, and the demonstrations by comparative biologists of the presence of bacteria in ova, as well as the established fact that 'structurally healthy testicles of tuberculous subjects can have bacilli detectable in their spermatozoa'—all of these considerations warrant the conclusion that tuberculosis may be inherited. That is, the most potent factor in the causation of tuberculosis can, in fœtal cases, be conveyed from a parent or parents immediately to the unborn child. To explain later developments, whether manifested in the lungs, or in the bones, joints, glands, or elsewhere, the assumption of heredity seems more adequate than the inhalation theory, particularly because in childhood the lung manifestations are decidedly in the minority, even if we do not include the considerable percentage (12) of latent tuberculosis reported by Bollinger and others who have made autopsies of children."

The question of the probabilities, in each case, of the influence of the family phthisis being direct transmission, susceptibility, or contagion have not been followed out so statistics on this point can be given, but I am acquainted sufficiently definitely with the circumstances of enough of the cases to be satisfied that the theory of contagion leaves many unaccounted for.

Whatever the explanation of the development of phthisis among those with family phthisis, there are certain differences between acquired and so-called inherited phthisis which have been demonstrated by comparison of cases in large numbers, as has been done by Reginald Thompson, Williams, and others, which make the recording of further cases of value, not only in assisting the elucidation of the origin of the disease, but its prevention, prognosis, and treatment. I will,

therefore, proceed to the analysis of my own cases and their comparison with others.

ANALYSIS OF CASES.—The number among the 250 cases of phthisis here reported in whom family phthisis was exhibited in parents, grandparents, uncles, aunts, sisters, or brothers was 139, parental 72, grandparental 19, collateral 48, while the acquired cases were 111. The accompanying table shows how the percentages compare with the statistics of others. It will be seen among five reports covering the same ground that there is a resemblance. On adding the percentages together and dividing by five, the number of reports, the average percentage thus obtained is 53.1 per cent. of heredity, which is within 2 per cent. of that of my cases, showing that they are average ones on the whole in this respect at least. Again, it will be seen that taking parental cases alone, the figures are closely alike, about 25 per cent., except those of Dr. Williams,[1] which are 12 per cent., while the percentage of the five reports is 23.4 per cent., showing my cases to be 5 per cent. more than the average, while Dr. Williams's are nearly 12 per cent. less than it. Dr. Williams accounts for his small percentage of parental cases by the fact that his patients were of the richer class of persons and the others mostly hospital cases. My cases also, however, were mostly of well-to-do people and not hospital patients. Whether the different nationality of the patients, English and American, accounts for this contrast, I do not know.

TABLE I.

Reporter.	Total No. cases of phthisis.	Total per ct. with family predisposition.	Percentage of cases.		
			Parental.	Grand-parental.	Collateral.
Solly	250	55.3	28.8	7.6	19.2
Williams	1000	48.4	12.0	1.0	34.4
Fuller	385	59.0	25.0	....	....
Denison	202	51.0	....	....	....
Fisk	100	52.0	....	....	....
Brompton Hospital	1010	. ..	24.4	....	....
Cotton	1000	....	25.0	....	....

[1] Pulmonary Consumption, by C. J. B. Williams, M.D., and Charles Theodore Williams, M.D. Second edition, London.

"Brompton Hospital reports include only parents. Dr. Cotton's 1000 cases, including, however, only parents, brothers, and sisters, gives 36.7 per cent. family predisposition, and Dr. Pollock's, with the same relations, 30 per cent. Dr. Copland, without particulars, puts it at 47 per cent. Louis, Briquet, and Rutz give confirmatory estimates."—Williams.

SEX.—Of the total number of cases 72.8 per cent. were males and 27.2 per cent. females; 52.7 per cent. of the males and 65 per cent. of the females exhibited family predisposition. This is in accord with the other statistics, which always show a higher per cent. of inheritance among females, though Dr. Reginald Thompson,[1] after an elaborate analysis and consideration of a large number of cases comes to the opinion that this discrepancy is due to the larger proportion of deaths among female infants, and that many of these deaths are from phthisis, though not so reported, and if they were included it would be found that heredity was present in about an equal proportion in the two sexes.

In acquired phthisis Thompson's statistics show that females have less power of resistance, are earlier attacked, and are more often acute.

He further shows that in inherited phthisis males exhibit increased susceptibility in early life and lessened resistance and a larger proportion of acute cases, thus bearing a strong resemblance to acquired female phthisis, while inherited females have the same characteristics as acquired, only exaggerated.

TABLE II.—AGE.

	Solly, 250.	Williams, 1000.
Average age of attack of total number of cases	29.5	28.2
hereditary	29.2	24.9
acquired	30.2	29.1
hereditary, males	27.0	27.0
hereditary, females	27.6	21.5
acquired, males	29.1	30.3
acquired, females	27.0	23.0

The average age of attack in my cases, as is seen, was a year later than Williams's. The hereditary cases of both

[1] Family Phthisis, by Reginald Thompson, M.D. Published by Smith & Elder, London.

sexes combined average a year earlier in attack in my cases than the acquired, while in Williams's they are as much as four years earlier. Taking them by sexes we find that my hereditary males were attacked two years earlier than the acquired, while Williams's were three years earlier. My hereditary females were attacked six months later than the acquired, while Williams's hereditary females were attacked seven and one-half years earlier. Thompson's statistics demonstrate, as do Williams's and mine, that the hereditary cases are earlier attacked, and that the females, both hereditary and acquired, are earlier attacked than the males, and this is especially true of the hereditary female cases, which latter is not so, however, in my statistics. Whether this is from the operation of some special cause or because the number of cases are too limited, I do not know. The fact that in other respects our statistics are closely alike makes the latter improbable as the reason. Thompson shows that out of 4000 cases, 2000 inherited and 2000 acquired, that up to twenty-five years of age the number of cases of inherited phthisis is more than double what it is after thirty years, being in proportion of 11 to 4.8, while in the acquired the proportion is only 3.7 to 7.4.

STAGE OF DISEASE.—With regard to the quality of the cases, of the total number 42.4 per cent. were in the first stage, that is, of tuberculization, 31.6 per cent. in the second stage, softening having commenced, while 24.8 were in the third stage, cavities being obviously present; of the hereditary cases 46.3 per cent. were in the first stage, 24.5 per cent. in the second stage, and 28.7 per cent. in the third; of the acquired cases only 27.8 per cent. were in the first stage, while they were 42.3 per cent. in the second and 19 per cent. in the third.

The larger proportion of first-stage cases, among those with family predisposition, is in accord with other statistics, and I found the same to prevail in a continuous one-hundred recently examined cases of my own, and also that the duration of the symptoms before treatment was begun was shorter among the

hereditary than among the acquired cases. Among hereditary cases the explanation of these two facts lies probably in this, that the knowledge on the patient's part of the danger from inheritance causes him to seek advice earlier, whereas the case with no family predisposition lives mostly in the fool's paradise of the common error that there is no consumption except through inheritance.

PHYSIQUE.—The limits of the paper do not allow of the showing of another fact, that of the comparative frequency with which persons of strong physique who are attacked with phthisis succumb, and as a strong physique is the greatest bulwark against the inroads of the disease, it is probably accounted for by the neglect of the warning on the part of the strong owing to the popular belief that subjects of consumption are only found among the feeble; whereas, we now know that the bacillus is no respecter of persons. Also being unaccustomed to take care of themselves they are, when out of health, less prudent than the delicate.

There is possibly another reason why those of a strong physique are frequently attacked, and why the disease when started is so often rapid and fatal in its course; it is that being born, as they usually are, of a stock untainted with phthisis, they have no inheritance to grant them a partial or complete immunity or even tolerance, and the tuberculosis follows a like course to that of syphilis and certain other diseases when they attack a community previously free from such affections.

RESULTS.—The results are grouped under four heads—cured, greatly improved, improved, and worse. The cured are those in whom all signs of disease have disappeared and whose general health is good. The greatly improved are those in whom the disease is apparently permanently arrested and the health good, and yet there remains some local signs or some disability. The improved are those whose fate is still uncertain, but whose tendency appears toward arrest and improvement; while the worse embrace all those who are deterioriating or have died, as the time of observation has been so prolonged most of these have died.

Totals.—Of the hereditary cases 39.5 per cent. were cured and 69.1 per cent. benefited. Of the acquired cases 52.1 per cent. were cured and 72.2 per cent. benefited.

First-stage Cases.—Of these 65.7 per cent. were cured, that is, in so far as this disease may admit of the term; while taking the cured, the greatly improved, and the improved together, it may be said that 86.1 per cent. were benefited, while 13 per cent. deteriorated. In the first-stage cases there were 62.5 per cent. cured and 89 per cent. benefited of the hereditary cases, while of the acquired there were 69 per cent. cured and 83.3 per cent. benefited. So that while of those with inheritance fewer are pronounced cured, yet the total number receiving benefit is greater.

The second and third-stage cases taken together show among the hereditary, cured 16.5 per cent. and 49.3 benefited, and among the acquired, 35.2 per cent. cured and 61.2 benefited.

We thus see while the hereditary cases did almost as well as the acquired where they came under the influence of the climate during the first stage, they did infinitely worse in the later stages.

TABLE III.—STAGE.

	Percentages.		
	Cured.	Benefited.	Worse.
Total of all the hereditary cases	39.5	69.1	39.9
Total of all the acquired cases	52.1	72.2	27.8
First stage:			
Total hereditary	62.5	89.0	11.0
Total acquired	69.0	83.3	16.7
Parental	70.6	88.2	11.8
Grandparental	66.6	91.6	8.4
Collateral	44.4	100.0	0.0
Second stage:			
Total hereditary	26.4	64.7	35.3
Total acquired	34.7	54.3	45.7
Parental	33.3	66.6	33.4
Grandparental	0.0	66.6	33.6
Collateral	23.5	57.0	43.0
Third stage:			
Total hereditary	6.6	41.6	58.4
Total acquired	17.4	56.5	43.5
Parental,	20.0	50.0	50.0
Grandparental	0.0	25.0	75.0
Collateral	0.0	50.0	50.0

The results among the three classes of heredity when compared with each other show that in all stages the percentage of cures is much higher among the parental than among the grandparental and collateral, and this superiority is more marked in the second-stage cases than in the first, and most marked in the second stage. The grandparental show more cures than the collateral in the first stage, and less in the second and third stage. Comparing the parental with the acquired cases, we find a little higher percentage of cures among the parental in the first-stage cases, and a decidedly lower percentage among the parental cases in the second and third stages.

This is doubtless explained by the parental cases in the first stage being those who were especially impressed with their danger, and therefore changed their climate earlier and were more cautious in their conduct, while those parental cases which deferred changing climate until their disease had advanced to the second or third stage did worse than the acquired, because many of them had inherited a worse physique, and their conduct was at least no wiser than the others.

The paternal and maternal cases show, on taking the total averages of all stages of each and comparing them, that while the percentage of cured is slightly better among the paternal, there were decidedly fewer benefited and more deteriorated, and comparing them both with the acquired the latter was in all respects much better.

In comparing the first-stage parental cases it is seen that the per cent. of cured is again higher among the paternal, as is that of the deteriorated, while the benefited are fewer, thus following the average of the totals.

In the second-stage cases the paternal continue to show a better per cent. of cured, while the average of the benefited is reversed, being higher than the maternal, and the deteriorated lower.

In the third-stage paternal cases none were cured, while 25 per cent. of the maternal are so reported, but more than twice the percentage of paternal cases were benefited.

It appears, therefore, that while on the whole the maternal received more benefit than the paternal, this was due to the larger percentage benefited in the first-stage cases, while in the second and third stage the percentage of benefited was higher among the paternal.

TABLE IV.—PARENTAL.

	Percentages. Total.	Benefited.	Worse.
Total of all the acquired cases	52.1	72.2	27.8
Total of all the paternal cases	40.9	65.9	34.1
Total of all the maternal cases	42.3	59.5	40.5
First stage:			
Acquired	69.0	33.3	26.9
Paternal	73.3	75.0	25.0
Maternal	64.7	94.1	5.9
Second stage:			
Acquired	34.7	54.3	45.7
Paternal	50.0	75.0	25.0
Maternal	27.2	63.3	36.4
Third stage:			
Acquired	17.4	56.5	43.5
Paternal	0.0	80.0	20.0
Maternal	25.0	37.5	62.5

Deterioration.—It is interesting to see how these results compare with those of Reginald Thompson, but the only point at which the comparison can be made is in the proportion of those who deteriorated, as Thompson does not give the results as to cured or benefited, but shows the order of severity, which is equivalent to my column of deterioration headed worse. In making this comparison we find that Thompson's results make the order as follows: Maternal worst, paternal next, and acquired best; while mine show the paternal to be the worst, the maternal next, and again the acquired best. Taking the benefited column in the same way, we get the same results; while looking at the cured column alone, we find the order the same as Thompson's, the paternal being a little better than the maternal. Again, comparing the worse column in each stage of my cases with Thompson's totals, we find that in the first stage the acquired are the worst, the paternal next, and the maternal best. In the second stage the acquired are again the worst, while the maternal have changed places with

the paternal. In the third stage the maternal are the worst, the acquired next, and the paternal the best.

It is perhaps well to look for a reason for this. In my cases the total maternal show up better than the paternal, contrary to Thompson's, which are from a very much larger number of cases, and, it is fair to assume, exhibit what may be termed the natural history of phthisis, as his statistics are almost entirely drawn from hospital patients who were subjected for most of the time of their illness to the trying conditions of life among the London poor, and who were all the time under the depressing influence of the English climate, both of which would more than offset the benefits of hospital care and treatment, and therefore it is probable that they exhibit the natural tendency of the disease without material hindrance from other causes; whereas the few cases I report, while showing a strong resemblance to those of Thompson's and other observers, and therefore probably being of the same average material as his to start with, exhibit a difference in the results as regards maternal and paternal cases. Possibly for these reasons, in referring to Table IV., it will be seen that my maternal cases show better than the paternal in the total, because the first stage is better, and it is probable that my number of first-stage cases is greater in proportion than Thompson's, and therefore have more effect on the totals. As the poor, from whom Thompson's cases are drawn, are more apt to delay seeking advice than the well-to-do people, who comprise my cases, therefore my first-stage cases have proportionately more influence than his; but as his cases are not reported as to the stage they were in when first coming under observation, this cannot be proved.

Again, Thompson shows that the disease among the maternal cases is markedly more acute than among the paternal, and that the largest number of the maternal cases die within eighteen months. That is evidently the natural tendency; but my cases, coming early under the beneficial influence of altitude, many of those were cured or benefited who would in London probably have died within eighteen months, whereas the paternal

cases, being naturally more chronic, would not be as quickly or markedly influenced in the first stage. While the arresting and curative influence of altitude is exhibited more or less, with some few exceptions, upon all forms and stages of pulmonary tuberculosis, it is especially manifested in its relatively brilliant results upon early acute tuberculosis, which is the form taken by most of the maternal cases, as shown by Thompson and confirmed by the observations of others, including myself.

The influence of sex upon my results is not apparent. While Thompson's extensive and voluminous statistics give some interesting points of difference, they do not apparently affect the general conclusions with which we have been dealing, and the number of my cases when divided up into sexes is too small at present to justify any conclusions or even inferences, and it suffices to say that I have looked into the matter sufficiently to be satisfied that my cases do not show any important sexual differences from those of Thompson.

Conclusions.—The conclusions arrived at from the foregoing study of family phthisis are, that the connection between phthisis in an individual and phthisis in the family of the same individual must be through one or more of three channels, viz., by inheritance of bacilli, by inheritance of susceptibility, or by contagion.

In the past the first channel, *i. e.*, direct inheritance of the tuberculosis, has been credited with being the most frequent and almost only route along which tuberculous phthisis travelled, and for this reason many cases without previous phthisis in the family have been unrecognized and untreated till in a hopeless condition, and many were ascribed to inheritance when the disease had in reality travelled along the third route, viz., that of contagion; and, further, undoubtedly many cases where the family phthisis had affected the individual only through the channel of an inherited susceptibility were attributed to true heredity. Admitting these points, and also that the cases of direct inheritance are very much fewer than was usually supposed, and the importance of realizing that

what most have thought to be the necessary doom of heredity can be averted in many cases and modified in all, by care of the sputum, cleanliness, sunshine, and ventilation in the dwelling, and also by the continuous healthy life and personal hygiene of the threatened descendant, *yet the evidence is too strong to ignore heredity as an important cause of tuberculosis.*

The recognition of heredity is undoubtedly of considerable importance in diagnosis, prognosis, and treatment, especially in the ordering of the life of the patient with respect to climate and occupation. And this recognition should not be lost sight of in the present much-needed crusade against careless expectoration.

The analyses of cases with family phthisis here given confirm in a general way what has been demonstrated by other observers, viz., that whatever may be the explanation of the pathological connection between the consumptive and his phthisical relations, there are certain broad differences in the character and course of hereditary phthisis when compared with the acquired disease. These stated briefly are that the percentage of females is higher among the hereditary than the acquired cases, and the hereditary females exhibit the characteristics of their sex when phthisical much more strongly, being earlier attacked and more of them dying within eighteen months, and also in showing less resistance. The male hereditary cases exhibit relatively the same peculiarities as the male acquired. The hereditary cases as a whole are much earlier attacked than the acquired, and the proportion of cases in the first stage when coming under medical observation is much greater among the hereditary.

In considering the origin and natural history of family phthisis, my statistics can be compared with a large number of other reports ; but as to results the means of comparison are more meagre, especially in reports from cases treated in high climates. However, those that are available bear out in the main the same conclusions, viz., taking all the cases in all stages together, and comparing the hereditary with the acquired, the results are better among the acquired than among

the hereditary, while in the first-stage cases alone there are more benefited of the hereditary than of the acquired.

The parental cases are shown to do better than the grand-parental or collateral, and the acquired better than the parental, except in the first stage. In comparing the totals of the paternal, maternal, and acquired cases, mine stand in the following order of results most benefited: First, acquired; second, maternal; third, paternal, Thompson's order is: First, acquired; second, paternal; third, maternal. While there is a strong resemblance between my cases and those of others, there are, as has been shown, points of difference, some of which are probably due to the especial influence of altitude. The theory that under certain conditions family phthisis grants immunity, or modified immunity or tolerance, receives some support from these inquiries, and from my own clinical impressions, but especially in the view that heredity cases when they do not die, as so many do, in the onset of the disease, are generally more chronic in their course toward death or recovery than acquired cases. And it may be said that the knowledge of inheritance, though depressing to the descendant, is also salutary in inducing prudence of life and a ready resort to medical aid when attacked.

DISCUSSION.

Dr. Babcock: There are two points of practical interest brought out by this very valuable paper. With reference to prognosis, this is shown to be worse in patients with hereditary tendency to tuberculosis than in the acquired cases. Secondly, it emphasizes the advantage of early removal and early treatment. The paper clearly brings out that hereditary cases improve in larger percentage than the acquired when early subjected to appropriate treatment, and that more patients recover in the early than in the late stages. We make a mistake, therefore, when we encourage patients with a marked tuberculous tendency to remain for treatment, instead of urging them to remove as speedily as possible to a favorable climate.

Dr. Otis: The statement is often made that tuberculosis is transmitted directly from the mother to the fœtus, as if it was a frequent

occurrence. It seems to me we ought to be a little cautious in making such a statement. We have evidence to prove that it is sometimes true; but we have not evidence to prove that it is of frequent occurrence. In the very last number of the *Revue de le Tuberculose* is an exhaustive paper upon this subject, the author of which has slipped my mind; the conclusion to which the author comes is that it *is* transmitted, but that it occurs rarely rather than frequently.

DR. KNIGHT: I would like to thank Dr. Solly for his valuable paper, and I regret it is too late to discuss it.

DR. SOLLY: I have no doubt, gentlemen, that so many figures are tedious for you to listen to, and therefore you can imagine how I suffered in the making of them. Two hundred and fifty cases alone prove nothing, but alongside those of other observers they become of marked value, and it is by each one of us recording and analyzing our own cases and then comparing them that we arrive at facts. Reginald Thompson's work certainly proves that there are marked and constant peculiarities in family phthisis. Much can often be done for hereditary cases at home by simply changing their mode of life, though, as a rule, it is much safer to change the climate also. When the question of return home arises, the being able to refer to the history of the case, especially with regard to hereditary tendencies, is of immense value, as it is a more serious matter for the hereditary than the acquired cases. It is not alone the râles, etc., that we hear, but the photograph, so to speak, of the patient and his forebears, that will allow us to make a prognosis and give advice for the future that will be of use. We practitioners in health resorts have especially to decide such vital matters as whether a patient must give up for a long time, or even permanently, his home, his relatives, his business, etc., or whether he is justified, and when and how, in taking the risks of return. For instance, if we advise the risk, when it is a risk, which is not always apparently the case, the part of the city or its suburbs they are to live in and like details must be considered, and thus we learn that these somewhat tedious inquiries into heredity become of practical value.

RECENT MEASURES FOR THE PREVENTION AND TREATMENT OF TUBERCULOSIS.

By GUY HINSDALE, M.D.,
OF PHILADELPHIA.

A BRIEF review of the extensive provisions for tuberculous patients abroad shows how far behind America is in the systematic care of this large class of sufferers. I do not, of course, refer to provision for those who are able to command, in addition to skilled medical attendants, the measures that promote recovery, and especially the advantages of favorable climates; but rather the hospital-class, of far greater extent, who need the housing, food, and care that they are unable to purchase. The well-to-do are at least as well provided for here as in Europe; but our State governments have not, to any appreciable extent, definitely helped the dependent class in this regard. The English began to look after the tuberculous more than a hundred years ago. An institution for their relief was established in Kent as early as 1791. The Hospital for Consumptives and Diseases of the Chest at Brompton, which was established fifty-four years ago, now has a capacity of 315 beds and an income of over one hundred thousand dollars. Other hospitals have been erected at Torquay, Bournemouth, and Liverpool; and in 1869 the Royal National Hospital for Consumption and Diseases of the Chest, at Ventnor, Undercliff, Isle of Wight. The last includes twenty buildings picturesquely situated, and has a capacity of 134 patients, and an ordinary income of $57,000. Altogether, England has eighteen institutions of this character, which receive annually between 6000 and 7000 patients.

The Victoria Hospital for Consumption, the first institution of the kind in Scotland, was opened November 22, 1894, and up to May 31, 1895, had received sixty-two patients. At present it is not available for advanced cases.

France has institutions at Berck-sur-Mer, Arcachon, Cannes, Argeles, founded in 1878, Touraine at Ormesson, and Villiers, on the river Marne and Villepinte. The city of Paris has also erected a large sanitarium for indigent tuberculous persons at Angicourt, near Liancourt, fifty miles from Paris, with a present capacity of 100, and provision for enlargement.

Germany has an institution for the tuberculous at Falkenstein in the Taunus, near Frankfort, under the care of Dr. Dettweiler. One at Ruppertshain, in the same neighborhood, is being erected for the accommodation of 75. In 1893 an institution was opened at Rehburg, in Hanover, for the tuberculous poor of Bremen; it has provision for twenty-four beds. In the first ten months 69 patients were admitted and about one-third were able to return to their occupations.

At Malchow, near Berlin, an institution was established in 1892 for men in any stage of tuberculosis. It has a capacity of 100, and cost $50,000. At Gütergotz, also near Berlin, a similar institution for 80 patients is projected; another, to cost 250,000 marks, is to be erected at Reiboldsgrün, at an elevation of 2160 feet, where there is already a small institution for persons of means. The city of Worms is also adopting similar measures for its tuberculous; so also in Würzburg plans are being formed to erect a sanitarium at Spessart. At St. Andreasburg and Blankenhain in the Hartz Mountains, and at St. Blasien in the Black Forest, successful institutions are conducted.

At Vienna Prof. Schrötter has made great efforts to have an institution established, and, with very liberal help on the part of Baron Rothschild, who has offered lands and money, his plans will be carried out. At Munich, Lübeck, Hanover, and Stettin similar institutions are being planned, and in Turkey an institution for the children of tuberculous parents is being established on the Bosphorus.

Much of the encouragement toward action on the part of municipalities has come from the remarkable success in the treatment of tuberculosis that has been obtained in private hospitals. Brehmer, who established his sanitarium at Görbersdorf, in Silesia, in 1854, reported after the first fifteen years that 20 per cent. of his 958 tuberculous patients had been permanently cured. Charles Theodore Williams recently stated that of 247 patients, chiefly in the early stages of the disease, who had been sent to the private Alpine Sanitaria, chiefly Davos, St. Moritz, and Arosa, "a cure was effected in 101, or 40.89 per cent.; great improvement in 73, or 29.55 per cent."

Subscriptions have been recently started at Bâle for a sanitarium for the phthisical poor at Davos. The institution is expected to be opened in July, 1896, and the city of Bâle has agreed to maintain a special hospital for the reception of a number of its consumptive poor.

Dr. Trudeau, in the last annual report of the Adirondack Cottage Sanitarium, which has just completed its tenth year of existence, states that from 20 to 25 per cent. of the patients have been apparently cured after a prolonged residence; cases in which the rational signs of pulmonary tuberculosis and the bacilli in the expectoration have been absent for three months or more, or in which there is no expectoration at all; any abnormal physical signs remaining being interpreted as indicative of a healed lesion. This, I may say, is still the only institution in this country that is strictly built on the cottage-plan. Two new buildings have been erected during the past year. The sanitarium has now twenty-two buildings, with accommodations for eighty-four patients. It has a free-bed fund of $14,000, through which it gives aid to the very poor, and an additional $25,000 has been put aside toward a permanent endowment-fund.

The new sanitarium at Paul Smith's in the Adirondack Mountains, at an elevation of 1800 feet, is nearly ready for the reception of patients. This institution is called the Sanitarium Gabriels, and will accommodate fifty persons. It will

be under the care of the Sisters of Mercy of the Roman Catholic Diocese of Ogdensburg, but is intended to be non-sectarian as regards the admission of patients. Dr. W. Seward Webb and Paul Smith have given 100 acres of land for a site, and Governor Morton and others have made handsome donations. An infirmary, an administration-building, and a half-dozen cottages are included in the plans. The first will be a handsome structure, two stories in height and built of wood and stone, with a glass-enclosed solarium and arrangements for the open-air method of treatment. A nominal charge will be made for treatment.

A recent movement in New York City to erect a memorial to the late Alfred L. Loomis, a former President of the American Climatological Association, has met with a liberal response. Already one gentleman has contributed $65,000 toward the proposed sanitarium for tuberculous persons now being erected at Liberty, Sullivan County, New York, in memory of our lamented friend. The plan includes a central building, with a number of surrounding cottages; two of these at a cost of from $3000 to $5000 apiece are being constructed on a plot of 190 acres. The elevation is 2000 feet, and is reached by rail in five hours from New York City.

New York has also a large institution, the Seton Hospital, for tuberculous patients, at Spuyten Duyvil, near the Harlem River. It has accommodations for two hundred, but at present has only thirty-two patients. The State of Massachusetts has recently appropriated $150,000 for a similar institution. Colorado has three such institutions: the Glockner Sanitarium, with a capacity of forty; the Bellevue Sanitarium, with a capacity of twenty-five, which, however, is not open at present, through lack of funds for maintenance; and St. Mary's Sanitarium, at Pueblo.

We have in Pennsylvania the Home for Consumptives at Chestnut Hill, a rural district of Philadelphia, that received during the last year ninety-one consumptive women. This institution has a new building in course of construction for the reception of twenty additional patients. It has a choice

situation, a liberal support, and about one-third of its patients are discharged each year improved.[1]

The Pennsylvania Society for the Prevention of Tuberculosis was organized April 10, 1892. Its object is the prevention of tuberculosis, first, by promulgating the doctrine of the contagiousness of the disease; second, by instructing the public in the practical methods of avoidance and prevention; third, by visiting the tuberculous poor and supplying them with the necessary materials for protecting themselves against the disease, and instructing them in their use; fourth, by furnishing the tuberculous poor with hospital-treatment; fifth, by co-operating with Boards of Health in such measures as they may adopt for the prevention of the disease, etc.; sixth, by advocating the enactment of appropriate laws for the prevention of the disease.

Efforts have been made by the Society to have tuberculosis placed upon the list of diseases returnable to the Philadelphia Board of Health, and to empower the Board to disinfect houses in which deaths from this disease have occurred. Similar measures have been carried out in New York City for the past six months with success, and are now compulsory in the city of Buffalo, N. Y., where the Department of Health is adopting energetic measures toward the prevention of tuberculosis. Since June 15, 1895, all cases of tuberculosis occurring in the practice of any physician in that city must be reported to the department. On receipt of such notice a circular of information is sent to the families or those in charge of the patient, giving strict rules as to sanitation, etc.

Recognizing that the consumption of meat and milk from tuberculous animals is one of the frequent sources and modes of tuberculous infection of the human being, especially of bottle-fed infants and children of tender age, the Pennsylvania Society resolved to urge upon the Legislature of the State the necessity of the early enactment of laws to secure the exclusion

[1] The good work of this institution will soon be greatly increased by a recent bequest of a private estate of fifty acres at Oakbourne, twenty-five miles from Philadelphia, and an accompanying legacy of upward of $200,000.

of the meat and milk of tuberculous animals from this Commonwealth. Under these laws about 500 living cattle and a large number of fresh carcasses have been condemned as unfit for the dairy and the market.

June 1, 1895, a new law, establishing a State Live-stock Sanitary Board, went into effect. This Board is composed of the Governor, the Secretary of Agriculture, a Dairy and Food Commissioner, and the State Veterinarian. To administer this law an appropriation of $50,000 will be at the disposal of the Live-stock Sanitary Board during the next two years, for dealing with the various contagious and infectious diseases, and for the first time in the history of Pennsylvania there will be a conservative and systematic plan of dealing with these diseases.

It is interesting to note in this connection that the Royal Commission on Tuberculosis reported in April, 1895, to the British government the conclusions of its important investigations, namely, that it is satisfied that the cause of an appreciable part of tuberculosis in man is conveyed through his food—*i. e.*, the meat of tuberculous cattle. The Commissioners believe that the danger lies not only in diseased organs unremoved in the dressing, but also in conveying to healthy parts tuberculous matter by means of the knives and clothes used by the butchers in dressing.

The Society for the Prevention of Tuberculosis has widely distributed its tracts, namely, 50,000 of tract No. 1, entitled "How to Avoid Contracting Tuberculosis;" and 40,000 of the other, entitled "How Persons Suffering from Tuberculosis Can Avoid Giving the Disease to Others." A great interest has been taken in the Society by physicians in all parts of the world. Boards of Health in almost every State in the Union have made application for these tracts, and have been supplied. Within a few weeks a request from Boston for 500 tracts and from San Francisco for the same number were received and very gladly complied with. Physicians in all parts of the South and West, in various portions of Canada, and even so far as the Hawaiian Islands, have made application for them.

Vigorous efforts were made during the past winter to secure the establishment in Philadelphia of a Municipal Hospital for the tuberculous poor. A committee of the Society also visited Harrisburg to urge the necessary State legislation to establish a State Sanitarium for tuberculous persons, to be located at a favorable elevation in the mountainous portion of the State. As a result of this visit the State Board of Public Charities of Pennsylvania recommended to the Legislature an appropriation of $50,000 to carry out the provisions of the bill. While these measures have not yet been successful, there is good reason to believe that the State will take the matter up as soon as some other important charitable measures, as, for instance, the new school for feeble-minded children in Western Pennsylvania and the new hospital for the epileptic insane, are accomplished.

The Society meets annually on the first Friday in May. Any person who pays one dollar or more into the treasury of the Society will be enrolled as a member for the year in which such payment is made. The by-laws provide that all money in the treasury, beyond that which is necessary for defraying the general expenses until the next meeting of the Board, shall be set aside for the use of a Hospital Fund. When the money in the Hospital Fund shall amount to $150 or more a tuberculosis patient shall be placed in a hospital for every $150 in the Fund.

There is no doubting that, as a result of the influence of this Society, of the American Climatological Association, and of kindred organizations, and the issuing of so many thousands of tracts disseminating the principles of the communicability of tuberculosis and the best means of preventing it, the people of the United States are beginning to take very much more interest in the tuberculous patient personally, and that they see the necessity of organized effort to lower the mortality and eventually stamp out the disease. The city of Philadelphia, at least, is showing a marked response to the efforts made to lower the death-rate from tuberculosis. In this city, notwithstanding its growth in population, the actual

number of deaths from pulmonary tuberculosis has gradually diminished since 1880. There were in each 100,000 of population 342 deaths from this cause in 1870, 317 in 1880, 264 in 1890, and only 220 in 1894.

We cannot tell in the State of Pennsylvania just how the mortality is tending, owing to our deficient system of registration; but we know that in Philadelphia there are about 6000 sick with tuberculosis, and in the State at large about 20,000 have the disease. In New York State the ratio of deaths from tuberculosis to the total deaths has steadily fallen since 1890. These facts are significant of the change that has come over the profession in the manner of looking at the disease and of treating it, and also of the attitude of the public itself, which is rousing from its long indifference. The people need plain teaching on this point, for most of them cling to the traditional idea that tuberculosis is strictly an hereditary disease, and consequently unpreventable. The large majority of people do not yet believe that it is contagious, and although, when requested, some persons may observe some of the sanitary precautions we advise, they do it often in a perfunctory manner. The other members of the family, who frequently take little account of the idea of the contagiousness of tuberculosis, do not co-operate in carrying out these measures. Greater efforts must therefore be made to reach the people.

More societies for the prevention of tuberculosis should be organized. We need to organize and maintain special hospitals and cottage sanitaria for tuberculosis. The first step is to find out the localities where medical measures will receive the greatest aid from natural resources—from air and altitude and sunlight. The patient who is weakened in body, deprived of his usual means of livelihood, face to face with a long illness, with little to supply for himself or his family the necessaries of life, not to speak of other needs relating to his disease, needs special help, and it is no wonder that little can be done in our cities to stay the course of this disease. The best solution of the problem, I believe, will be to take these

afflicted beings out of cities to brighter skies and evergreen forests, where nature and art, hand in hand, may work together for their good, and, it may be, for their final cure.

DISCUSSION.

Dr. Beverley Robinson: Statistics from distinguished observers in sanitariums may present to our minds what is absolutely scientific, but there is a kind of practical experience which doctors in more or less general practice, with a good sprinkling of phthisis, are obliged to have and to form their own conclusions concerning. There are a few facts with which I am personally familiar and, without being derogatory to two noble institutions with which I have been connected, I will state.

I was connected for a period, certainly twelve or thirteen years, with the New York Hospital, out-door department; I had a throat class and a heart and lung class. I lived for several hours, three times a week, in a little room which I believe was never thoroughly disinfected; it was clean, in a certain way, it is true. There were many men there who did not come as patients who have breathed the air of that room, yet not a single one was known to have taken phthisis there. I do know of more than one who, under present theories, had a perfect right to take it. I do not know of one who did. Why not?

I speak of my observations in private practice, also. Technically speaking, I believe tuberculosis to be contagious. Practically, it is very slightly so, I believe.

We may illustrate this by reference to other diseases with which we are familiar. In a paper I read before the Association of American Physicians and Surgeons last year I reported, from a letter written to me by Dr. White, who was at that time resident physician in the Diphtheria Hospital in New York, in which he made the absolute statement that no case of diphtheria was known to have been taken in that institution. Therefore, to his mind, there was no proof of its contagiousness through the air, yet we know how satisfied the majority of us were with the idea of contagion in that disease after this manner. There is a microbe of diphtheria, formerly regarded as specific; now we know that microbe may be found in relatively healthy mouths.

Regarding the origin of pulmonary tuberculosis, we do not doubt it is connected with a form of bacillus. But I do believe there is a cer-

tain habitat connected with this bacillus, about which we know nothing, which at times is highly pernicious and at times is not. I have now a patient who has any number of bacilli in his sputa, and yet I have received lately a long letter from him stating he is very well. From my private practice, giving thereto much careful observation, I do not get such results always as these scientific institutions report.

Second, I am connected with another institution, *i. e.*, St. Luke's Hospital, New York, an institution for which I have only good to speak, as I had for the New York Hospital. In this institution, St. Luke's Hospital, we do the best we can for our phthisical patients. We feed them well, care for them well; we give them what we consider advisable in the way of drugs. And I must confess that, so far as the amelioration of the phthisical condition is concerned, I do not see how large municipal institutions are going to do very much better.

The reason the public are so little alarmed is not because the public are so little acquainted with the facts; but there is a little hard headedness outside of the medical profession, which the medical profession cannot always control. They do not think it is absolutely and always true, any more than I, that there is a region specially suited for consumptive patients. For instance, I know that the Adirondacks, in certain regions, is not better for them than many other places. I know this from reports which come to me from thoroughly well-informed, bright men who tell me in regard to their surroundings there. These sanitariums are often made, supported in fact, by some man of great courage, great perseverance, indorsing, upholding, and praising certain places. Far be it from me to cast a shadow of reflection upon the late distinguished man who once presided over this assembly; yet it was the strong personality of Prof. Loomis that made in part the great fortune and credit of the Adirondacks. Many places in the Adirondacks are damp, and anything but adapted to consumptives. I have reason to believe that such a place as Sharon, New York, where the soil is porous, the air all that could be desired, etc., if you could weed out certain conditions, you have in it as good a sanitarium as any through the Adirondack region.

I must, in some sense, indorse Dr. Quimby. In the last few years there has been a strong tendency to push what we consider strictly scientific opinion and observation, and to throw aside the common-sense views of the vast multitude of observers in the profession and outside. There was a wise and witty Frenchman (Voltaire), who said: "The reason of all the world is a little better than the reason of any one man." And I am of the opinion that this reason of the multitude would at times be a better and surer guide than the *ipse dixit* of the pure scientist.

Dr. Frederick I. Knight: I wish in this connection simply to

mention a matter which I am going to bring up at the business meeting to-morrow; that is, a resolution in regard to the importance of the establishment of hospitals for tuberculosis. The necessity for such a resolution came home to me with force recently when I was before the Finance Committee of the Massachusetts Legislature with reference to this very subject. The question was put to me, Have the medical societies of the country made any formal declaration which has been put on record, in regard to the establishment of such hospitals? Fortunately I could reply that some of our societies had made such a record.

I was astonished to see how readily these men—most of them politicians—took to the hospital idea, not only showing sympathy with homeless patients, but with the idea of preventing the spread of a disease which was communicable. To our surprise, on our first effort, both houses passed an appropriation of $150,000, which was signed by the Governor, for the establishment of a hospital for the consumptive poor.

Certainly, if the disease is infectious, we must make provision for the poorer classes of patients, who are unable to care for themselves and who do spread the disease right and left.

I should have been glad to have had such a document as Dr. Hinsdale's to present to that committee. I understand that in England the practitioners really feel that the disease has been very materially diminished by their hospital accommodations, which have been greater than in any other country so far. I should like to know if any other State has made an appropriation for this purpose. I know an effort has been made in one or two, but I am not aware that any other State has really come up to the mark as Massachusetts has this year.

The resolution will come up to-morrow at the business meeting.

Dr. E. O. Otis: I should like to add one word. When we appeal to a philanthropic public for their money and their aid, and their encouragement to the establishment of hospitals for phthisical patients, it seems to me our first idea should be to help the largest number. For one incipient case we have ten of more or less advanced who apply for care and aid, and these latter cases should receive the first attention. I must confess I am a little tired of the appeals for hospitals and sanitariums for incipient cases. It seems to me if it is to be a pure charity, it should be to the largest number of sufferers, the advanced and tubercular cases, to which our first attention should be given, or at least they should have an equal chance with the incipient ones.

Dr. F. I. Knight: In view of what Dr. Otis says I should like to state that I, at first, was in favor of the incipient cases; but after talking with some of the legislators I began to see that the general sentiment was to take care of the man in his dying days, and I think that

is the correct plan. I believe that where the State is called upon to aid, certainly it ought to look after those helpless, in the worst stage, and not only after incipient cases. But the two classes should be kept strictly distinct.

DR. C. E. QUIMBY: I speak on this subject with a great deal of reluctance. While I do not wish to be considered old-fashioned or behind the times, or pessimistic, I recently have come to stand in a very different position toward it. I am willing to admit that tuberculosis is dependent upon the tubercle bacillus and transferable from man to animals and back again, and that, scientifically, it is as contagious a disease as is smallpox.

Having admitted all that, I very much question whether we are on the right track, and whether the prevention and stamping out of tuberculosis is not to be marked by the death-rate. It is a question whether all we are doing is not simply to collect tuberculosis and distribute it in large quantities.

The hospitals we build are for poor people. Now, to my mind, consumption is largely a question of cash; it depends much on right living; that a man has had enough to eat throughout his prenatal period and throughout his own life is a most important factor for the prevention of tuberculosis.

Of these patients from sanitaria who are reported cured and go back to the city, 90 per cent. are practically certain to develop tuberculosis again. All we accomplish is to spend our money and send them back to scatter their sputa about. Statistics show that of those in the earlier stages 20 per cent. are arrested for a time, and then sent back to start up the disease again; 40 per cent. more are made easier, and the time during which they spread tubercle bacilli is increased, while in the end their lives are not saved.

I admit that this brings us apparently to a hard-hearted position; yet I have no question that this is the position which we must eventually assume. It is upon this that I have put forth effort to establish not a hospital, but a dispensary, where patients who must work, and who are working, can be cared for. Through the kind support of Dr. Loomis that was established a year ago, and cases are treated there as dispensary patients. We have two sets of hours, forenoon and evening hours, for those who cannot leave their work. They come for treatment during the office hours. We have averaged during the last year something like three hundred treatments per month with the cabinet to this class of patients. I have not cared at present to give statistics from those cases, until we can have something more than the report of a year. I may say, as a matter of general report, that nearly all patients have been helped. Some have been helped for a time and then passed into the second stage. A good many have been turned back to the point where they do their work with ease and comfort.

I question whether the speediest solution of the question is not to build hospitals for hopeless cases, putting them in such hospitals, and with lots of food—and lots of morphine, if that helps the matter any—make as easy as we can their passage from life.

It may be that is a heartless position. It does not seem so to me, because in this way we shall not only cull out those cases which may be put out into active life again, but leave such cases in active work, taking the sources of infection away from them rather than them from the infection.

The hospital started at Liberty is not on this line, however. Hopeless cases come daily, and I am compelled to turn them back on the streets. Now, the hospital that is built for the *hospital* consumptive, takes him in and recognizes him as a hopeless consumptive and treats him so, is, to my mind, the height of Christian charity.

I hope I shall not seem to you unreasonable or unjust in this matter. I hesitate to say it, yet it has been on my mind for a number of years, since I have seen a good deal of phthisis, and a good deal that comes back from sanitariums.

DR. THOMAS DARLINGTON, JR.: Dr. Hinsdale's paper brings to my mind an evil. In the northern part of New York City there are some large tracts of land held by moneyed men, waiting for the advance of the city; and these tracts are let out in small divisions for the purpose of feeding cattle. Some are of ten or twelve acres, one is of fifty acres, all within New York City. In the midst of these tracts is a new consumptive hospital—the Seton Hospital. Opposite is a field in which fifteen cows are kept. The consumptive patients from the hospital go over to the field and play quoits, and the field is literally covered with sputa. Here the cows feed. I am much interested in watching the result on the consumers of the milk.

DR. GUY HINSDALE: I might have referred to one or two other institutions in my paper; that is, to the Sanitarium at Sharon, Massachusetts, also to Winyah Sanitarium at Asheville. The Seton Hospital, of which I spoke, is located at Spuyten Duyvil, N. Y., and has been open only six months; thirty-two patients are under treatment; in all ninety have been received, two-thirds of whom were free. There are four endowed beds; the institution has a capacity of two hundred. The hospital is intended for those in a curable stage, and is under the care of the Sisters of Charity.

THE EARLY RECOGNITION AND THE CLIMATIC TREATMENT OF PULMONARY TUBERCULOSIS.[1]

By H. B. MOORE, M.D.,
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Each year's added experience with the high-altitude treatment of pulmonary tuberculosis impresses me freshly with the idea that certain elementary facts relating to this very valuable therapeutic method, although often detailed by interested students of the subject, are constantly lost sight of by physicians prescribing this mode of treatment. The most important of these relates to an early recognition of the true nature of the case, so that the altitude-treatment may be instituted at once, and to the desirability of a more or less prolonged residence at the high altitude. Disregard of reasonable forethought in these particulars, more especially the first point, leads to great disappointment on the part of patient and friends, and brings undeserved disrepute upon the treatment. I am willing to admit that some of the blame for this should rest upon the shoulders of too enthusiastic admirers. A goodly portion of it, however, belongs properly to that large body of practitioners who no sooner read of a new cure than they proceed to try it indiscriminately upon every case of the malady coming under their observation.

What is true of other diseases and their medical treatment is also true of the climatic therapeutics of pulmonary tuberculosis. It is far from wise to send every such case to Colorado to try the high-altitude treatment. The prospect for an arrest or cure of this disease diminishes very rapidly with its advance, and what has been a most favorable case may soon

[1] Read by title and not open to discussion.

become inappropriate for this climate. Prophylaxis is always better than cure, and the family physician, seeing a rapidly growing boy or girl with imperfect chest-development, in a family predisposed to tuberculosis, can often avert a catastrophe by sending the child to a high altitude. The outdoor life, sunshine, and rarefied air of these regions are the most rational and perfect preventives of which one can conceive. Such cases are common in the experience of all physicians, and a practical recognition of the truth of this statement will lead to most gratifying results.

When too late for prophylaxis, and the disease is actually in progress, it seems to me (and my experience in this line has been such as to create strong convictions on the subject) almost criminal to keep the patient at home trying cough-medicines, creosote, guaiacol, cod-liver oil, hypophosphites, etc., during that valuable time, often so short, when climatic treatment is really capable of rendering radical assistance in the struggle with the invading enemy; but, alas, often, one might say usually, the patient is kept at home until the vital powers are weakened by advanced disease, and then, finally, it is decided to send the patient somewhere for his health. Is this reasonable, and can anyone who has the slightest grasp of the subject imagine, for an instant, that any climate will materially help a considerable percentage of cases of this kind? The system is already poisoned with the products of suppuration, and each day finds the cells less able to cope successfully with the already existing disease-area, to say nothing of its spread. This phlegmatic conception and management of tuberculosis is not rational and can never succeed.

One must have a sharp, clear-cut appreciation of the fact that a great danger menaces every individual whose tissues have become the site of the slightest degree of this form of bacterial invasion, and that, although some subjects are found to possess a remarkable degree of tolerance for the disease, as a rule the existence of any considerable amount of tuberculous tissue in the lungs constitutes a handicap too great for nature to oppose successfully.

One error probably oftener fallen into than any other, even by physicians, is the idea that a person who looks well, or fairly so, cannot have tuberculosis. They cannot harmonize the appearance of an apparently healthy person before them with their conception of the pale and wan tuberculous patient, and forget that tuberculosis is an infective disease, which, like other diseases, has a beginning as well as an end, and if the symptoms are suspicious they think their science is at fault and call the disease "bronchitis" or a "cold that lingers," instead of by its right name. It would be interesting to know when, in the opinion of a large number of our professional brethren, these ailments ceased and actual tuberculosis began. I have had the misfortune to see large numbers of self-deceived, or doctor-deceived, human beings with tuberculous cavities, hectic fever, etc., arrive in Colorado Springs as cases of "bronchitis," "protracted cold," etc., and die in due time. On the other hand, it is a real satisfaction to examine some of the patients sent to Colorado by men thoroughly conversant with the subject, who make an early diagnosis and act on it at once. As a case in point, of which I am glad to say there are many, that of a young man, already becoming well known in our profession, comes to mind. He had been an athelete in college, and on arrival in Colorado Springs was a picture of healthy vigor, broad, full-chested, and with a good, healthy color; yet a little suspicious cough existed, and examination of the chest revealed beginning slight trouble at an apex, and the sputum-examination showed quite numerous tubercle-bacilli.

Cases in which the tuberculous infection is discovered early and there is scarcely more than a little infiltration at the seat of invasion, are ideal, and may be taken as models of what we should strive after. Often nature comes to our aid, and declares, by means of a small hemorrhage or slight spitting of blood, that tuberculous invasion has occurred at some little point in a person who has not previously coughed or been unwell in any way. Such an occurrence, although very alarming to the patient, is really a most fortunate one if prop-

erly interpreted and acted upon by the physician. Often, however, the doctor discovers that some point in the throat (usually) or the bronchial tubes is the seat of alleged congestion, which he assures the patient caused the bleeding, and encourages the latter not to be alarmed, and so the probably valuable significance of the warning is lost and not thought of again until its repetition, or warnings of another character throw unpleasant light on the subject.

It may be asked with propriety whether the very early cases are the only ones that it is wise to send to a high altitude, and whether conditions so efficacious in prophylaxsis and in the early stage of the developed disease are without efficacy in cases that are further advanced on first seeking advice as to the advisability of a change of climate. The reply to this question would be that the high-altitude treatment is the treatment suited especially to the earlier manifesations of the disease, the subjects of which still retain a large amount of their accustomed vigor and are able to avail themselves fully of the advantages of outdoor life in mountainous climates, which, from the very nature of things, are not very equable and which require a considerable amount of hardiness to withstand temperature-changes readily perceived by delicate anæmics and subjects of hectic fever. At the same time every physician with experience in elevated regions can recall many cases presenting relatively extensive areas of disease in subjects possessing a considerable degree of tolerance for the disease and free from fever, who thrive in these regions and live many years.

Actual cure, however, is rare in these cases, the disease being merely arrested and liable to begin afresh on return to damp sea-level climates. A very extensive area of even inactive disease would constitute a decided contra-indication to the high-altitude treatment, as a considerable amount of good healthy breathing space is necessary for a patient to obtain the requisite amount of oxygen in a rarefied atmosphere. It is rarely wise to send active febrile cases advanced beyond the first stage to a high altitude. The deeper breathing required

and the exciting character of the climate are very likely to promote destruction of existing consolidation and increase fever. Many such cases are seen in Colorado, in which, so far from being aided, the end is undoubtedly hastened.

As regards the other point to which I wish to call particular attention, viz., the necessity of a more or less prolonged residence at high altitudes, it is a serious error to give a patient going to Colorado on account of tuberculosis the idea that he is simply to go there for "two or three months," or "to spend the winter." It is very rarely that expectations of this sort can lead to anything but disappointment, as the disease is of such an essentially chronic character that this length of time is scarcely more than sufficient to furnish an idea as to the probable efficacy of the climate in an individual case.

Right here rises a question that is often difficult to answer, viz., When is a patient cured of pulmonary tuberculosis and when is the disease only arrested and completely inactive? And yet it is, to the last degree, important for the patient to have this question answered correctly if he wants to return home. Some might say that a case may be looked upon as cured when the cough and expectoration have ceased entirely, when râles have disappeared from the chest, and the weight and general bodily functions have become normal; but it is a matter of everyday experience that under such conditions the patient frequently again begins to expectorate bacilli-laden sputa and to exhibit all the symptoms of renewed activity, showing that the disease was not cured and that the tissues had constantly contained live bacilli and larger or smaller areas of tubercle ready to soften at the proper time. It seems, therefore, as a rule, much wiser for the physician at home to be very conservative upon this point and to instil into the patient's mind, from the first, the idea that the contemplated change of climate, if found on trial to meet the patient's needs, must be a long and perhaps permanent one. If the patient hears this for the first time from his new physician after leaving home, he is naturally surprised at the lack of accord between this advice and what he had been led to believe pre-

viously, and feels homesick and unprepared for so radical a change in his plans.

The desirability of the change of climate being very long or permanent is especially manifest when the patient is right in the midst of what might be called the most vulnerable age; when physique and family tendencies all indicate a subject of pronounced susceptibilities. Under these circumstances a premature return home after arrest or cure (?) might lead to a fatal relapse. Colorado Springs has to-day hundreds of citizens who have lived here for years with a good practical degree of health, enjoying their share of the activities and pleasures of life, and yet they are not cured of their tuberculosis, and could not return to their former homes with safety. Many others have been completely cured and could live anywhere, but remain here from choice and the growth of local interests.

With respect to this point of prolonged residence our American high-altitudes in Colorado possess most conspicuous advantages over high-altitude resorts abroad, like Davos-Platz, St. Moritz, etc., which are purely and simply health-resorts, offering no opportunities for occupation to those who need it and having no permanent society or home-life. In short, a young tuberculous person who has been sent sufficiently early in the disease to Colorado soon finds that he has not been consigned to a health resort for life, but that he has simply changed his residence to another portion of the country filled with communities with many attractions, where work and a career still await him. It must not be inferred from these statements that Colorado has more positions than people to fill them or that it is especially easy to get remunerative employment, for such is not the case. On the contrary, the unemployed poor are found here as everywhere; but it is meant that talent and ability in all lines can find scope for their exercise here as promising as elsewhere, now, and with an encouraging prospect for future growth, often absent in the Eastern States. The lot of the very poor, who are at the same time ill, is a hard one anywhere, and must remain so until means are devised by the State or by individuals to relieve this most distressing form of need.

A PEEP INTO THE FUTURE, WITH RESPECT OF PATHOLOGICAL-ANATOMICAL RESEARCHES.[1]

By CARL RUEDI, M.D.,
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It is not my object to go into all the details which may affect the above question; I only wish to state what has been done and what ought to be done in the near future. Mankind always suffered from diseases and people had to die from diseases, and, according to the state of civilization, the idea of disease and the methods in the science and art of healing them have altered. The nations of low standing in civilization attributed disease to evil spirits that invaded the human body, and this evil spirit had to be fought by the body and its medical adviser, and the question was, Who was the victor and who the victim? We still have the expression "he fights the disease." But already Hippocrates introduced positive substrata into the medical world as vehicles of diseases, and his four fluids—blood, mucus, yellow and black bile—were for many centuries the leading factors of disease and the foundation of the humoral pathology, which lasted until 1858. Not that during all these centuries this had been the only doctrine of diseases; already the Romans had a powerful school where the "solidar pathology" was taught, and the keen operators of this era looked more after the solids than the fluids. In the middle ages, since Paracelsus, the vitalistic ideas commenced to grow, and as the vitalismus was principally attributed to the nerves and nervous centres, "neuropathology" was invented, with Hufeland as highest representative of this

[1] Read by title and not open to discussion.

school, 1795. The nerves pathology—the study of the organs in the different stages of the disease and the explanation of the alterations in the tissue—had commenced already with Bonnet, in 1679, and has been followed up particularly by Morgagni, 1761; but these ideas were not widespread, and even in this century publications of high standing, as Rokitansky and Stack, as representatives of the different schools, tried hard to defend the standpoint of traditional medicine. Stack and Schoenlein still wanted to put disease down as an intruder into the organism, and Stack even hopes that the diseases will be classified in general species, according to the nature of the intruding organism, 1838. The great Rokitansky invented, in 1846, his dyscrasia sanguinis, wherewith he tried to explain a number of diseases as the result of alterations in the blood and the lymph. The works of Bonnet and Morgagni had not been forgotten, and with the greater perfection of the microscope, and particularly the microscopical technic, the study of the organs was taken up again and followed up to the utmost. Magendie and Cruveilhier were faithful workers, and T. Muller, of Berlin, with his ingenious ideas of the pathological experiment on animals, with following microscopical examination, soon levelled the path for further development.

Virchow published his *Cellular Pathology* in 1858, and the description of the different alterations in the tissues was so positive and sure that cellular pathology ever since was the guiding star in the medical profession, particularly, too, because every doctor was enabled to see for himself the alterations in the tissues, and he could convince himself of the diagnosis. Since this time we have stood under the influence of the cellular pathology and the humoral pathology; the vitalistic theories and the ontologic ideas have been entirely wiped out. Cellular pathology is a goodly structure and has helped to put medicine into one of the first ranks of natural sciences, and when combined with art it is one of the finest professions; but still, to an observant physician, the cellular pathology as it stands now cannot be perfect.

First: The cellular pathology gives us a most minute description of all the alterations in the tissues of the body after the body is dead and the slide under the microscope; it gives us the explanations of growth, decline, degenerations, and progressive metamorphosis to a nicety after the patient is dead or the organ removed; but I, myself, would like to know why these alterations have taken place? What is the reason that a gray swelling of the epithelial cells sets in? Why do all these degenerations and metamorphoses come on? And I also would like to know these things during the lifetime of a patient, while I am at the bedside, as well as in the dissecting-room. In my opinion, the pathogenesis in the cellular pathology is by far too feeble, and the help at the bedside almost *nil.* Physical examination shows us the seat and the extent of the disease; anamnesis and symptomatology must give us cognizance of the character of the disease, and the chemical examination of the secreta and excreta helps us in some cases; but every doctor knows that anamnesis and symptomatology are not always to be depended upon, and frequently after the disease has been physically localized the diagnosis must be left in suspense.

Secondly: In a fair number of cases the examination of the organs of the body does not give one the impression that the alterations seen would produce death. I only need to remind you of many cases of infectious diseases where, after a very short illness, life is cut short with very slight alterations in the tissue of the body, as scarlet-fever cases that die on the third or fourth day of the disease, and, again, diphtheria in the early stages. Cases of anæmia, malaria, scurvy, morbus Werlhoffii (purpura hemorrhagica), are just those diseases which are principally represented in the dyscrasia sanguinis of Rokitansky; then we have very often hardly a causa mortis before us; we have some lesions in the throat, in the kidneys, on the mucous membrane, but nowhere a lesion that would entitle us to say that this lesion produced death. In many cases of this nature, if they run with high fever and show intrinsic nervous symptoms, death is put down to the nervous system, although

hardly such alterations in the nervous centres are seen as could *eo ipso* account for death, since we know that the nervous centres can stand powerful lesions before death *must* be the result.

Thirdly: Cellular pathology fails to give us an acceptable explanation of the most important symptom in disease. It has tried its utmost to explain the fever, but without any success, simply because the fever has not its origin in the cells. Traube invented the idea of the temperature regulating centres, but these centres never could be localized nor verified, and in the newer text-books they have luckily been omitted. Then came the theory of the secretion of the glands and the heat produced by muscular exercise, and we hear even that by these means one degree of temperature can be raised within an hour in a patient; but nobody can explain with this theory why the temperature of a phthisical patient, lying in bed day and night, should be in the morning 95° F. and in the evening 104° F., when the functions of the glands are normal as far as can be ascertained. Look at a plain malarial attack: A person has a good sleep after dinner, and at 3 P.M., in waking, he feels cold and shivering, and at 3.30 P. M. he has a temperature of 103° F. Are, in this case, the glands and the muscles the cause of this rise in temperature? The two cornerstones of Virchow's *Cellular Pathology* are: *Omnis cellula e cellula*, and this sentence I fully indorse until the opposite is absolutely proven; every cell in our body must have a mother cell, or no new cells are formed. Then the second: All the functions of the body are produced by cells, and therefore pathology must be a cellular pathology. In 1858, when Virchow published his book, one could understand this expression, as it was particularly directed against the humoral pathology and the vitalistic theories, but even at that time already new ideas came forward with Pasteur, who gave us a clear knowledge of the fermentation, and soon afterward a description of microbes that were deleterious to the silk-worms and so forth. This science, bacteriology, then made marvellous strides forward with all the men of high standing,

as you know very well yourselves. What does bacteriology teach us in regard to pathological anatomy? It preduces of these bacteria outside of the animal body a toxin, which is a deadly poison to the organism, like tuberculin and tuberculocidin, and whatever their names may be. This is the same poison that the bacillus Kochii produces in the body infected with this bacillus, and if you inject more of this poison into a patient suffering from this disease naturally he will react; just the same as if you would inject a little more strychnine into a rabbit that you nearly killed with the nux vomica.

But bacteriology has gone further; it has found out that the body is able to produce an antitoxin. This means to say that the body is able to produce a stuff which counterbalances the poisonous effects of the products of these microbes that enter the human body, and already in rabies, tetanus, and diphtheria we have antitoxins which are likely to do good. I am far from saying that any of these treatments are perfect; this mode of treatment is only six years old (rabies), and the obstacles that it has to encounter are so great that a longer period of time must pass by before we can expect anything that resembles perfection; but still I hope that even in our day we shall be able to witness grander results. Already the ingenious idea of giving an animal a chronic diphtheria and of making use of the antitoxin which is produced in its blood-serum for the cure of the same disease in mankind is so attractive that it should be followed to the utmost. This is the road which medicine must take principally nowadays. As far as the microscope can reach, cellular pathology has done its duty, and, generally speaking, it is a fairly compact structure; only questions of detail are at variance, and these will be solved by the same or other means.

I objected to the second cornerstone of Virchow's *Pathology*, because bacteriology teaches us that in the blood-serum itself, without the help of any cellular tissue, stuffs are produced and contained which have a specific influence upon the organism; and Ziegler, in his last edition, admits already that fever is

produced by stuffs originating from microbes that invaded the human body and whose products have been absorbed and circulate in the blood-current. So the blood-serum has probably other functions than being the nutritious fluid to the cells and to carry the waste of the cells to the excreting glands. What do we know about the blood-serum, the lymph, and the intercellular fluid? If we take away from the blood the red and white blood-corpuscles, which we can count and observe under the microscope, of the rest we know hardly anything. We know that it is dangerous in a transfusion to inject a large quantity of blood; we know that by an injection of blood-serum from one animal into another fever is produced; we know that the injection of a physiological salt solution is less dangerous than the injection of the same amount of blood-serum. But this is about all that is proven.

If we look now a little closely to the alterations that must take place in the blood-serum we shall probably come to a conclusion that varies somewhat from the cellular pathology. Different forms of albumin have been found in the different organs of our body; but if we look at the chemical constituents of the serum-albumin with $C_{56}N_{14}$, and consider the changes of this stuff until it passes our kidneys as urea with CN_2 or uric acid with C_5N_4, what intermediate changes must have taken place and how will all these chemical bodies influence our organism? Lately, under the guidance of bacteriology, with Hoppe–Seiler as principal promoter, a number of chemical stuffs have been isolated from the animals under treatment, or in the test-tube. They have received the names of albuminates, albuminoids, and albumoses, and in them we still have some of the albumin-reactions, but one or more of them are missing; up to the present day we have no sure knowledge of the derivatives of the albumin as it passes our body. These intermediate stuffs have probably little influence, as every healthy body can easily get rid of them, and the body, when necessary, has the power to neutralize their effect; but still I think they must make a vast difference in the animal economy, as we know quite well what a difference it

is to have the uric acid not oxidized to urea, or C_5N_4 to CN_2, and even this comparatively slight alteration in the economy of our body can cripple many subjects. The blood-serum has been looked at ever since the inauguration of the cellular pathology as a sort of step-child, but I would like to ask, Does it matter to the cells what they are nourished with? Can we expect that a cell which is badly nourished, or supplied with a nourishment which is actually obnoxious, can do its work as it is expected to do? The cells, I suppose, are just as much subject to the metabolism as any other living being, and they must react on poor or insufficient nutrition just as well as anything else. We read nowadays a great deal of indifferent cells, round cells, and so on, and we hear that some of the newgrowths are particularly composed of these indifferent cells. Why are they indifferent? Because nothing tells them to differentiate; they live and multiply, and nothing gives them the impulse to go over into connective tissue or anything else.

If we look into the whole of our organism we can see that we were too much under the influence of cellular pathology. The human body contains 80–84 per cent. of fluid and 20–16 per cent. of solids. I will not say that medicine up till now only dealt with 16 per cent. of our body; the cells contain by far the greatest quantity of fluid, but I do not think that all the remaining fluid—the blood-serum, the lymph, and the intercellular fluid—is in our body without an object, and can be dismissed in our text-books of physiology and pathology on two or three pages. Here is the lever where the future generation has to put in its strength, and by chemical and micro-chemical researches it must give us the key to ascertain in what state the blood-serum is as a bearer of nutrition to all the cells that have to do the functions of the body. We must get so far that in a few drops of blood we can ascertain the state of the blood-serum, and there is no reason why we should not get so far. If as much labor had been spent on the micro-chemistry of the blood as on the microscope we would be a great deal further on in our science. Ever since

1858 the labor was concentrated upon this one cellular pathology, and everything else neglected until the newly-born daughter of natural sciences—bacteriology—showed us that there is something else that has to be calculated with. The serum examination is a very difficult problem, and wants no end of animal experiments: first, to find the micro-chemical reactions of the different derivatives of the albumin, then to study the effect of serum injections into animals of the same species; then, again, to observe the alterations in the animal body produced by serum injections derived from a different species of animals. This done, one has to put an animal under the influence of a pathogenic microbe—typhoid, cholera, tuberculosis, diphtheria, and so on—and study the influence of the blood-serum of these infected animals, and, finally, the experiments on mankind have to be made. These are not easily made, as not everybody wants to play the rôle of a test-tube, and to get the necessary material it might be considered whether those people who behave so nastily that the laws of the country consider them fit to be hung might not be made use of. The ethical side of this question I do not wish to touch, but these people, as a rule, know so little of ethics and act so strictly against them that really this difficulty would be almost imaginary, particularly if we consider that this person can do more good to mankind than he did it harm. Thus far I have tried to break a lance for humoral pathology, but a little different from the undefined standpoint of former ages. I put down as requisite a method of examining the blood-serum *in vivo*, with reference to its capability of nourishing the cells and to give us the means to decide what alterations in the cells have to be expected, or to give us an explanation why the different degenerations in the cells take place. These are, in my opinion, strictly questions of nutrition, and the blood-serum has to do this work, and so we ought to know something about it. Before we come to this point in our science we shall still work in the dark.

With the vitalismus I have not yet finished. The deeper

we go into the study of natural science the oftener we come to this point—*principium vitæ.* We have in our body a great number of processes, which cannot be explained except by philosophical reasoning, which ends always in *principium vitæ.* Why do the fibrinogen and fibrinoplastic substances not combine with each other in the blood-current or the intercellular spaces? Because the formation of fibrin would stop the circulation and destroy the body. Physiology gave the child a name and called it "fermentum," and kept quiet; but nobody has seen or knows anything of this fermentum. Why does free hydrochloric acid originate in cells and is thrown out into the stomach to digest the albumin, while the same cells contain in their protoplasma carbonate of sodium, and in the intercellular substance the carbonates are well represented? Because the organism wants this free hydrochloric acid for prolongation of life, and so even chemical affinities have to be overcome by the living cell. Why does the intestinal tract eliminate iron that has been injected subcutaneously? Because the iron would be too dangerous a substance to pass in these quantities through the kidneys, and so it has to go through the intestines, although the epithelial cells of the intestine are not made for this purpose. These are only ideas, but still this part of medicine ought to be kept in mind, at present maybe only to collect facts to give a future generation the opportunity and material to study the great question, What is life?

SUNSHINE STATISTICS.

By MARK W. HARRINGTON,
SEATTLE, WASH.

THE sunshine—that is, the presence of a direct ray of the sun, not shut off by cloudiness—forms one of the most interesting elements of meteorology, from a sanitary standpoint. It is, therefore, of interest for this Association to be informed of the character of these statistics, and to have some indication of the conclusions which can be formed from them. Such is the purpose of this paper.

The data discussed are all from the United States, except in the cases of the two stations of Toronto and Winnipeg, in Canada. The number of years during which these data have been collected is smaller in the United States than in Great Britain, and the members of the Association will find a large literature and long series of observations in English and other European publications. None of these relate to the United States. In this country the longer series have been taken at Central Park, New York, and at Blue Hill Observatory, near Boston, Mass.; but these observations have not been reduced to a consistent form, and are, therefore, not yet available for discussion.

The data considered here are from twenty stations in the United States, besides the two in Canada. They are illustrated by the tables presented herewith, which give the average percentage of sunshine for each hour of the day, for each month of the year; that is, placing possible sunshine for an hour at 100, the figures in the tables, expressed graphically, will give the part of 100 in which sunshine has been actually

observed, on the average. To convey the facts still more clearly, several of these stations have been selected and the data represented graphically.[1]

There is also presented herewith a copy of the actual record of the photographic sunshine recorder and of the thermometric sunshine recorder.

The paper naturally divides into three parts:

First, a discussion of the photographic sunshine recorder, with the results which have been obtained from it. These are the only results which are given here in detail.

Second, a discussion of the thermometric sunshine recorder.

Third, a comparison of the results obtained in the United States from these two records. In connection with the latter is a series of tables of simultaneous observations at the same place, with the two different forms of recorders.

It is proper for me to acknowledge the very great assistance given me by Mr. A. J. Henry, Acting Chief of the Division of Records and Meteorological Data of the Weather Bureau, in the compilation of these statistics.

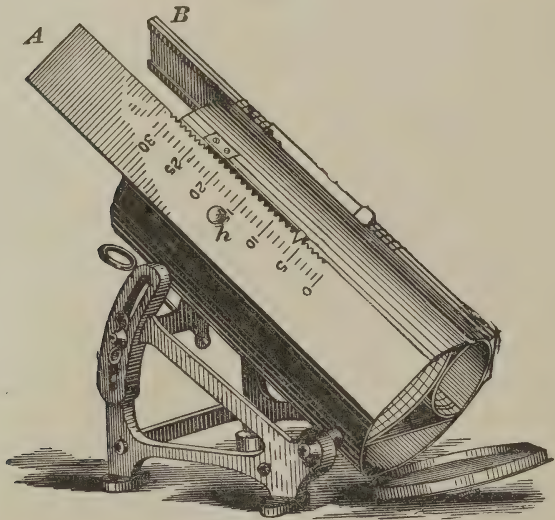
Photographic sunshine recorders of the pattern described by Prof. Marvin in the *Report of the Chief of Weather Bureau*, 1891–1892, pp. 29, 30, were sent to twenty stations in 1890.

Sunshine Recorder. The pattern of sunshine recorder used on stations is a modified design of the Jordan photographic recorder. Its construction will be understood from the illustration, Fig. 1. The large cylinder is adjustable in its supports, which are provided with a graduated arc by which the axis of the cylinder, when adjusted properly north and south, can be made parallel with the earth's axis. This cylinder can also be entirely removed from the support without affecting the adjustment for latitude. The two sheets of ferro-prussiate paper adapted to receive the records of the forenoon and afternoon sunshine, respectively, are inserted at the bottom end of the instrument and made to conform to the

[1] The tables and charts were not furnished in time for publication.—Ed.

concave surfaces of the segments of corresponding forenoon and afternoon cylinders within, as may be seen in the figure. The slides, *A*, *B*, are pierced each with a fine hole bevelled out to a sharp edge and at a wide angle, thus permitting a small beam of sunlight to pass and form an image of the sun on the paper beyond. The hole in the slide *A* is shown at *h*. Each slide is notched and adjustable to 31 different positions, corresponding to the days of the month. The sheets of paper are ruled vertically with a set of lines representing hours of time from about 4 A.M. to noon on the forenoon sheet and from noon to about 8 P.M. on the afternoon sheet.

FIG. 1.



Sunshine recorder.

In order that the trace indicating sunshine for any particular day of the month shall occur at a predetermined place on the sheet, notwithstanding the changes in declination of the sun from month to month, a series of lines are ruled across the bottom of the sheet, each line corresponding to a month of the year, and the position of the line so related to the declination of the sun for that month that, if the sheet be cut off

across the bottom at this line and inserted in the recorder with this edge flush with the bottom of the instrument, the traces of sunshine from day to day will fall upon predetermined positions and can thus be identified with any particular day of the month, whereas, without this provision, if, for example, the first day or two of a month were cloudy and no record produced, uncertainty might arise as to the correct identification of the traces, since these would occupy different positions on the sheet from month to month.

The use of this recorder has not been attended with much satisfaction, owing wholly to the imperfect and irregular action of the photographic paper. The best records are obtained from stations in the West, where there is a large proportion of bright sunshine and the air is comparatively dry.

The records for the first year were incomplete, owing to a variety of causes. Those of the second year, 1891, were an improvement, in some respects, on the first year, but only ten of the twenty stations were able to secure an unbroken record for the whole year. In the following year sixteen stations completed a full year's record, and there was a general improvement in the quality of the record secured, except at stations on the Gulf Coast and points having a very damp climate.

The sensitized paper used (ordinary photographic "Blue" paper) does not keep indefinitely, under the most favorable conditions, and it was found to deteriorate very rapidly when exposed in the warm, moist climate of the Gulf Coast, even as far inland as New Orleans, La.

The daily amounts of sunshine, as determined from photographic records for 1891 and 1892, were published in the *Report of the Chief of the Weather Bureau*, 1891–1892, pp. 457–481, where they may be consulted.

The present compilation has to do with 1892, 1893, and 1894 *only*, except in the case of Buffalo, N. Y., where the year 1891 was added, and at Winnipeg and Toronto, Ontario, when a ten years' record was compiled from the published

reports of the Meteorological Service of the Dominion of Canada.

The hourly amounts were first tabulated by observers in 1894, and a so-called twilight correction was applied to the early morning and late evening hours to compensate for the failure of the instrument to make a record of the sunshine at these hours. Ordinarily this correction amounts to about an hour both morning and evening, although the correction is sometimes greater in the morning than in the evening, and *vice versa*. No general law is noticeable, though it is believed that local conditions, such as the surface of the ground being covered with snow, and the varying actinic power of light, with latitude, and the season of the year, will account for the irregularities noted.

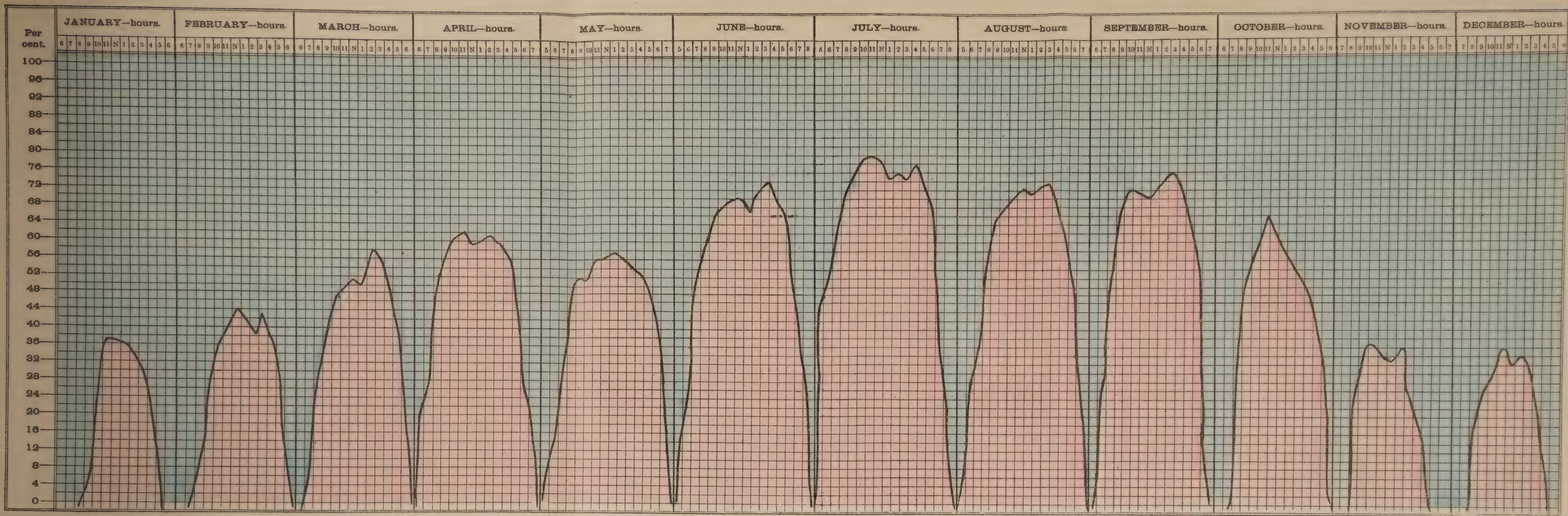
In many instances the photographic trace, originally indistinct, had faded so that it was almost impossible to determine where it began and ended. Systematic errors were also found in some cases in the records of the noon hour. The photographic sheets of Memphis, January, 1892, and Tucson, November, 1893, herewith, are defective at this hour and are typical cases of the errors referred to. In all cases where the deficiency at the noon hour was clearly due to some mechanical imperfection, a whole hour was accredited to the imperfect record. There were cases, however, where it was not possible to determine whether the deficiency at the noon hour was an actual physical fact or due, as above stated, to imperfections in the apparatus.

The twilight correction could not be applied to the records for 1892 and 1893. The early morning and late evening hours for these years are, therefore, incomplete and should be used cautiously, if at all. In making the general mean of three years it is possible to apply an arbitrary correction as in the case of Buffalo, but this has not been done for the remaining stations.

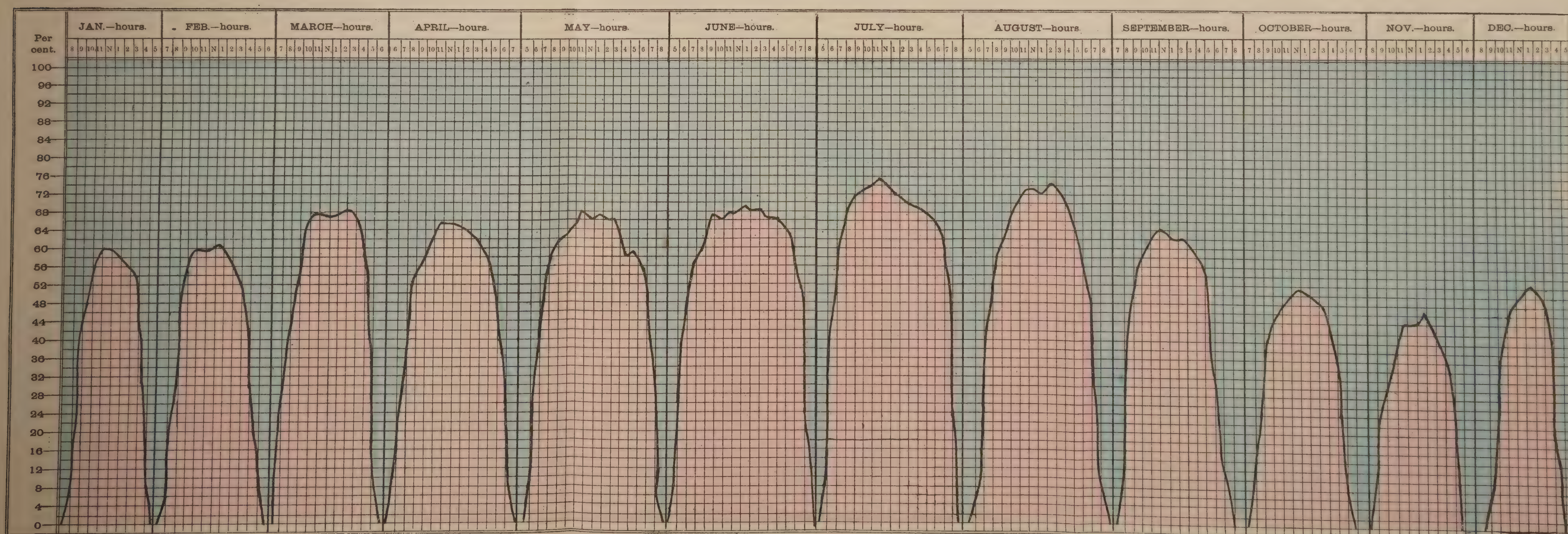
The thermometric sunshine recorder was supplied to a few stations in 1883. On December 31, 1894, twenty-four were in use, some of which were issued to replace photographic

Chart showing the Normal Amount of Bright Sunshine, expressed as Percentage of the Possible Amount of Sunshine for Each Month of the Year and Each Hour of the Day the Sun is above the Horizon, recorded at Buffalo, N. Y.

Sunshine.
Clouds.

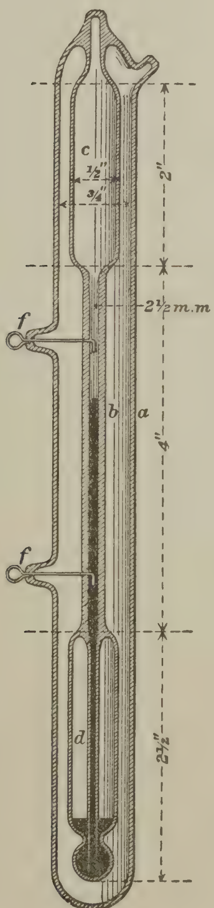


Recorded at Winnipeg, British America.



recorders. A description of the thermometric recorder by Prof. C. F. Marvin follows:

FIG. 2.



THERMOMETRIC SUNSHINE RECORDER. The record from this instrument is produced electrically and only one intensity of sunshine is recorded. The instrument begins to record for

a certain intensity of sunshine, which may differ slightly with different instruments, and continues in the same manner no matter how much more brightly or with how great a variation the sun may afterward shine, provided the intensity at any time does not fall below the critical point.

A section of the instrument is shown in Fig. 2. The principle of its operation is essentially that of the Leslie differential thermometer. The U-shaped tube construction of that instrument, however, is modified so as to place the two bulbs *c* and *d* in the same straight line. The connecting narrow-bore tube *b* is fused to the bulb *d* so that a slender prolongation of the stem extends quite to the bottom of *d*, which is there formed into a spherical portion with a constricted neck. Two platinum electrodes, *f*, *f*, are fused into the stem *b*.

The lower bulb and a short portion of the stem above are blacked with a coating of lampblack in very thin shellac or balsam, and the whole arrangement is enclosed within an outer thin glass tube *a*, having at first an outlet at the top or one end and adapted to be perfectly exhausted and hermetically sealed.

In filling the apparatus a portion of mercury is first introduced, which being so disposed by laying the device horizontally or bottom end up as not to obstruct the passageways, the bulbs and stem are thoroughly dried internally by repeatedly exhausting and filling with artificially dried air. The walls of the glass are also heated artificially. Finally, the appartus is cooled in freezing mixture for the purpose of increasing the density of the contained air, and the outlet tube fused off and hermetically sealed. The vacuum within the tube *a* can be made either before or after the filling of *c* and *d*.

An improvement in the construction of the instrument, suggested recently by Mr. C. B. Tuch, of the Instrument Room, consists in adding a small quantity of alcohol with the mercury. This acts as a lubricator for the mercury in tube *b*, and its vapor plays an important part in the thermometric

action of the instrument. No instruments of this kind have been used in any of the observations herein reported.

After filling, it is a simple matter, by shaking, to distribute the confined air within the bulbs, so that when in a vertical position, as shown in the figure, and when the two bulbs have been brought to sensibly the same temperature, the top of the column of mercury stands about one inch below the upper electrode *f*.

The instrument is exposed in an inclined position on an appropriate support. Its axis is placed approximately parallel to the axis of the earth, and in this condition the top of the column of mercury will be about 0.3 of an inch below the upper electrode as long as the temperature of the two bulbs is the same.

Under the action of sunshine the blackened bulb becomes heated, causing the mercury to ascend and pass above the upper electrode. As soon as the electric circuit is completed through the mercury column, the fact is recorded on the register, which is the so-called "Triple" register of the Weather Bureau. (See *Annual Report*, 1891–1892, p. 24, Fig. 9.) The rainfall magnet R of this register is also made to record the sunshine, which is possible, in view of the fact that little or no rain is likely to be recorded during periods of sunshine, and *vice versa*. In order that the sunshine circuit shall not be continuously closed during sunshine, a circuit-maker is attached to the clock, whereby complete connection is made for a second or two only, one each minute. By this expedient sunshine is indicated on the record sheet as a succession of short lateral strokes at time-intervals of one minute; cloudiness being shown by a continuous straight line. The duration of sunshine, as indicated by this device, is thus recorded to the nearest minute. In a few instruments the record is made only each five minutes.

Sensitiveness. All instruments are not strictly identical in respect to the quickness with which they respond to changes in cloudiness or sunshine. A dense cloud suddenly obscur-

ing the sun in bright sunshine will not be recorded within three or four minutes, and *vice versa.*

The critical condition for registration to which all instruments are adjusted will be understood from the following extract from Instructions to Observers :

The inclination of the recorder will be adjusted to such an angle that the mercury column will just close the electrical circuit during times when the disk of the sun can just be faintly seen through the clouds. If the cloudiness is such that the observer cannot clearly distinguish the sun's disk, then the mercury should not rise high enough to close the electric circuit.

Comparative hourly values, as given by the two forms of apparatus, have been worked up at four stations, viz.:

Buffalo	3	months.
Cincinnati	2	"
Portland (Oregon)	3	"
Salt Lake City	14	"

From the comparisons at Buffalo no definite conclusions can be drawn. The thermometric recorder registered decidedly more sunshine during the warmer hours of the day in two months out of three, but during the early morning and late evening hours the differences were not marked. Comparisons at Cincinnati were made during January and July. In January the thermometric recorder fell below the photographic at all hours of the day except 5 P.M., the falling off being most pronounced in the forenoon from 9 to 11. In July the agreement between the two instruments is very close, the thermometric registering 3.5 hours in excess of the photographic. In this month the photographic recorder gave the most sunshine in the morning hours from 5 to 9.

The Portland comparisons are limited to three months, January to March, inclusive. In January and February the thermometric recorder registered considerably more sunshine than the photographic, except in the morning hours, when the amounts are nearly the same. In March the two instruments

agree closely, the difference being but six hours in favor of the thermometric.

Salt Lake City. Here we have fifteen months comparative readings at a station where the sunshine is not far from the average for the whole country. The results present some curious anomalies. In January the photographic recorder registered the greatest amount of sunshine by fifteen hours. The cloudiness was above the average. In February, with cloudiness about normal, the thermometric recorder registered the greatest amount by twenty-one hours.

In both these months and throughout the year, as at all the stations thus far examined, the excess of the thermometric over the photographic occurs in the warmer hours of the day, and there is a marked deficiency in the thermometric as compared with the photographic in the morning and evening hours.

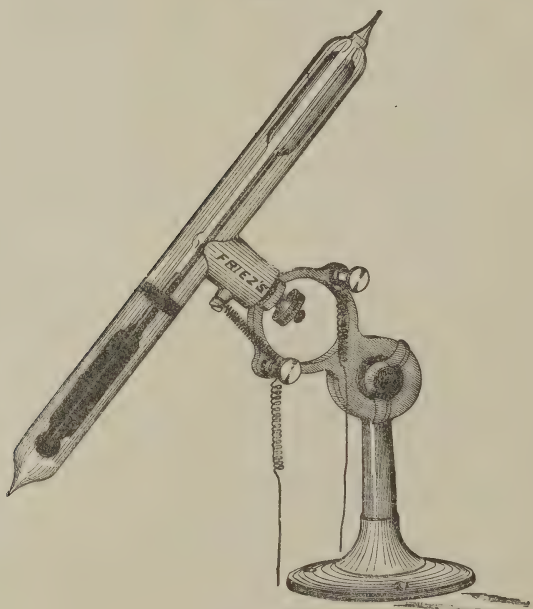
When we sum up the record at Salt Lake City for the year, however, the difference is not so great, being but fifty-five hours in favor of the photographic.

We have also made a comparison of the same month of different years at this station with the following results:

		Total hours.
January, 1894.	Photographic	121.6
	Thermometric	106.5
	Difference	+15.1
January, 1895.	Photographic	102.1
	Thermometric	117.6
	Difference	—15.5
February, 1894.	Photographic	131.0
	Thermometric	152.4
	Difference	—21.4
February, 1895.	Photographic	135.4
	Thermometric	142.6
	Difference	—7.2
March, 1894.	Photographic	170.4
	Thermometric	178.1
	Difference	—7.57
March, 1895.	Photographic	199.0
	Thermometric	203.0
	Difference	—4.0

Comparing the results from the two instruments with the observer's personal estimate for twelve months, it is found the thermometric agrees most closely in eight months and the photographic in four months. This fact has no special significance, however, since the difference between the records of the two instruments are in many cases quite small.

Fig. 3.



The comparisons thus far made seem to establish the following: (*a*) The thermometric recorder registers the greatest amounts of sunshine during the warmer hours of the day, the photographic during the hours from sunrise to about 11 A.M., and from about 4.30 P.M. to sunset; (*b*) The differences between the two instruments for a considerable period—as a year—are not great; and (*c*) with increase in skill in manipulating the instruments and tabulating the data, it is believed the two forms of apparatus will give almost identical results in the long run.

ATMOSPHERIC TEMPERATURES DURING THE MONTH OF JULY.

By W. F. R. PHILLIPS, M.D.,
U. S. WEATHER BUREAU.

Atmospheric temperature as an important element of climate in general, and of climates in particular, is too well recognized to require an apology for its introduction to your notice.

The fact that two or more places may have the same mean temperature, either annual or monthly, does not of necessity imply identical thermal conditions. An example will illustrate this fact more forcibly than an elaborate theoretic explanation. Thus, Des Moines, Iowa, and Tatoosh Island, Washington, have the same annual mean temperature, namely, 49°. But the mean temperature of the hottest month at Des Moines is 75° and at Tatoosh Island 56°. The mean temperature of the coldest month at Des Moines is 18° and at Tatoosh Island 41°. The highest temperature recorded at Des Moines is 104°, at Tatoosh Island 78°, and the lowest temperature at Des Moines 30° below zero and at Tatoosh Island 7° above, being a total range of 134° for the former and 85° for the latter.

Thus it is seen that for a correct apprehension of the thermal conditions of different places, even though on the some isotherm, it is necessary to consider the various phases of atmospheric temperature.

The more important of these phases are :

1. The mean daily temperature, or the average degree of heat received in twenty-four hours, which meteorologically

defined is the arithmetical mean of twenty-four hourly observations; but which in practice is found to be more easily, and sufficiently accurately, obtained by using the mean of the highest and the lowest temperatures recorded by self-registering thermometers.

2. The mean daily maximum temperature, or the average of the series of the daily highest temperatures recorded at any moment and during a given period.

3. The mean daily minimum temperature, or the average of a series of the daily lowest temperatures recorded.

4. The average daily range of temperature, or the difference between the mean maximum and the mean minimum temperatures.

5. The mean daily variability of the temperature, or the average difference between the mean temperatures of any two consecutive days.

6. The absolute maximum temperature, or greatest degree of heat received at any moment during a given period.

7. The absolute minimum temperature, or the lowest degree of heat received at any moment during a given period.

The five first phases show the temperature probabilities, and the two last the temperature possibilities of a climate. In addition to these statistics of temperature, it is desirable that we should possess information as to the frequency of spells of several consecutive days, of either very hot or very cold weather; but to obtain this information it is first essential that we settle upon what shall be regarded as the minimum limit of an excessive departure from average conditions. This is not by any means an easy matter to determine, as an instance will show: At Galveston, Texas, only four times in fifteen years has a daily mean temperature in July been four degrees above the normal for the month, for that period (84°). At St. Louis, Missouri, in the same years there have occurred eighteen days having mean temperatures of ten or more degrees above the normal, or more than twice the number at Galveston. If only the numerical values of the departures from the normals be used as the standard of comparison,

Galveston, when compared with St. Louis, would appear never to suffer from periods of abnormally excessive heat; but we find that while in fifteen years on sixteen occasions a mean daily temperature of 87° has been maintained for three or more consecutive days in St. Louis, yet, during the same period, on twenty-three occasions a mean of 86.3° has been maintained for three or more days in Galveston. The average duration of these periods of high temperature has been six and eight-tenth days at Galveston and five and six-tenth days at St. Louis.

The question as to the possible physiologic effects of such temperatures, as well as the determination of the limits that shall constitute excessive departures, I submit as features worthy of future study and consideration.

The subject to which I particularly invite your attention is the distribution of temperature over the United States during the month of July.

This month has been chosen because, first, it is the hottest period of the year; secondly, the high temperatures prevailing during this month are closely associated with the prevalence of a very fatal disorder of infantile life—cholera infantum—for which we recognize in change of climate an effective measure of both prevention and cure; and, thirdly, the probability that the great heat of this month is not altogether unconnected with the sudden increase in the prevalence of enteric fever that usually takes place in the succeeding months of August and September.

The temperature records and data to which I shall refer are those of the Signal Service, War Department, from 1871 to 1891, in which latter year they were transferred to and continued to the present time by the Weather Bureau, Department of Agriculture.

With but few exceptions, the records are of fifteen or more years of continuity, while some are continuous from 1871–72.

Throughout the month of July the mean daily temperature exceeds 70° in the States bordering on the South Atlantic and Gulf Coasts, in the States of the Ohio, lower and middle

Mississippi valleys, in the greater part of the Middle Atlantic States, and of Kansas and Iowa. In the extreme northern part of the United States the mean daily temperature seldom reaches 70° for more than three or four days. The lowest mean daily temperature recorded is 56°, at Tatoosh Island, in the extreme northwest corner of the country, and the highest mean daily temperature is 92°, at Yuma, Arizona.

The average July temperatures recorded at the Weather Bureau stations along the northern border of the United States, beginning at Eastport, Maine, and going westward, are as follows: Eastport 60°, Oswego and Rochester 70°, Buffalo 69°, Erie and Cleveland 71°, Sandusky and Toledo 73°, Detroit 72°, Port Huron 68°, Alpena 66°, Marquette 65°, Duluth and St. Vincent 66°, Williston 69°, Havre 68, Spokane Falls 69°, Port Angeles 57°, Tatoosh Island 56°. Along the southern limits, beginning at Key West, with 84°, and going westward, are Tampa 82°, Pensacola 81°, Mobile 83°, New Orleans 82°, Galveston and Corpus Christi 84°, El Paso 83°, Yuma 92°, and San Diego 68°. On the Atlantic Coast are temperatures ranging from 60° at Eastport to 84° at Key West, or a difference of a little more than one degree of temperature for each degree of latitude. On the Pacific coast the difference between Tatoosh Island, 56°, and San Diego, 68°, is 12° of temperature for 16° of latitude, or three-fourths of a degree of temperature for each degree of latitude; but the difference is not uniformly distributed, for from Tatoosh Island to San Francisco there is but 3° difference, while from San Francisco to San Diego there is 9° difference.

The isotherm of 70° passes through southern New Hampshire, westward through northern New York, across Lake Erie, through lower Michigan into extreme southern Wisconsin, then northwesterly through Wisconsin, traversing central Minnesota, the contiguous portions of the Dakotas, into Montana, where bending southward it passes through Idaho, and parts of Nevada and Oregon, into northern California, to near the coast, where it turns sharply to run south-

easterly, until near Los Angeles it leaves the land and emerges on the Pacific.

The isotherm of 80° traverses the southeastern portions of North Carolina, the northern parts of South Carolina and Georgia, northeastern Alabama, central and western Tennessee, northern Arkansas, Indian Territory, extreme northwestern Texas, southern New Mexico, central Arizona, and southern California.

The isotherm of 90° is seen in the southwestern portion of Arizona and in southeastern California. Small portions of the isotherm of 60° are seen in northern Maine and in northwestern Washington.

Between the isotherms of 70° and 80° are included all the States, except Oregon, Washington, and parts of New Hampshire, Vermont, Michigan, Minnesota, North Dakota, Montana, and Idaho to the north of the isotherm of 70°, and Texas, Louisiana, Mississippi, and Florida, and parts of Arkansas, Georgia, and South Carolina, to the south of the isotherm of 80°.

The mean maximum temperature varies from 69°, at Eastport, to 90°, at Key West, on the Atlantic Coast; from 61°, at Tatoosh Island, to 74°, at San Diego, on the Pacific Coast; and from 77°, at St. Vincent, to 98°, at El Paso, and 107° at Yuma, in the interior. In the Gulf States the mean maximum temperature ranges from 90° to about 95°, and in the northwestern and western parts of Texas from 93° to 99°. On the Atlantic Coast, south of North Carolina, the average maximum is 90°. In the Middle Atlantic States, the Ohio, middle Mississippi, and lower Missouri Valleys, in Kansas, Nebraska, Colorado, and the central plateau regions, and in the greater part of California, the mean maximum temperature ranges between 85° and 88°. In the States along the northern boundary of the country and in Wyoming the average maximum varies from 75° to 80°.

The mean minimum temperature varies from 52°, at Eastport and Tatoosh Island, to 79° at Key West, and 62° at San Diego. In the South Atlantic and Gulf States, and in

the lower part of the middle Mississippi valley, the mean minimum ranges generally about 73°, while in the Middle Atlantic States, the Ohio Valley, lower Lake region, lower Missouri and upper Mississippi valleys, in Kansas and Nebraska the average minimum is about 55°.

East of the Mississippi River we may expect a mean daily range, or a daily difference between the highest and the lowest temperatures of the day of about 18°, and west of the Mississippi a difference of from 5° to 10° greater, increasing with the elevation above sea-level. On the Pacific Slope the difference ranges generally from 10° to 15°, but may vary greatly as affected by either altitude or proximity of water, as at Sacramento it is 30° while at Tatoosh it is only 9°.

The variability of temperature, or average difference from day to day, is less in July and August than in any other months of the year, and it is so nearly alike in either that it is not practicable to discriminate between them in this respect. In other words, July and August are the most equable months of the twelve as regards temperature. On the Pacific and Gulf Coasts the variability is little more than 1°. As we go northward and inland the variability gradually increases. In the latitude of Savannah it is equal to 2°, and in that of Washington City 3°. The greatest variability is observed in Montana and the Dakotas, where it reaches 4° to 5°.

The absolute maximum temperatures recorded in the different States in July have been pretty nearly uniform. 108° has been observed at Havre, Montana, and 106° at San Antonio, Texas. Some of the most notably high temperatures are: 122° in Death Valley, Cal.; 118° at Yuma, Arizona; 112° El Paso, Texas, and Red Bluff, California; 110 at Tucson, Arizona. Temperatures of 102° to 105° have been generally observed in all the interior States.

The absolute minimum temperatures recorded have ranged from 70°, at Corpus Christi, Texas, to 31°, at Havre, Montana. The minimum temperatures appear to be more influenced by latitude in their distribution than the maximums.

The greatest absolute range of temperature is, as might be

inferred, experienced in the Northwest, and the least along the Gulf Coast.

East of the Rocky Mountains the highest one-day mean temperatures have been observed generally in the central valleys and in the South Atlantic States. The highest mean recorded for one day is 94°, at Augusta, Georgia, and the next highest 93°, at Kansas City and San Antonio. Temperatures of 91° and 92° have been recorded generally throughout these regions. On the immediate Gulf Coast and in the extreme lower Mississippi Valley the highest means for one day that have been noted have been from 87° to 89°. In New England, the Middle Atlantic States, the region of the Great Lakes, the Rocky Mountain and the Plateau regions, the highest mean temperatures for one day have been about 85°.

The lowest mean temperatures for one day have ranged from 75°, on the Gulf, to 55°, in the northern portions of the United States. In the greater part of the country the lowest mean temperatures range between 60° and 65°.

North of the 35 parallel of latitude the mean July temperature is generally from four to six degrees higher than that of June and from two to three degrees higher than that of August. South of this parallel the July difference is from two to three degrees greater than June, and one to two degrees greater than August.

CLINICAL RESULTS FROM THE USE OF TUBERCULIN AND ITS MODIFICATION ANTIPHTHISIN (KLEBS) IN PULMONARY CONSUMPTION.

By H. LONGSTREET TAYLOR, M.D.,
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Statistics are always dry, but often very instructive; and as so many members of the profession still disagree with Professor Koch in his statement that "he feels that in tuberculin he discovered something good for mankind," every series of carefully recorded and observed cases should be unhesitatingly given to the profession, as only in this way can the question ultimately be settled.

These cases have been treated as ambulatory patients, as no special institution exists near St. Paul in which they could be received; and the results are in consequence not so good as if the work had been done under the most favorable conditions found in a sanitarium. As far as possible, however, without the advantage of constant supervision, the patients have been subjected to a very severe *régime* in regard to their mode of life, diet, sleep, exercise, bathing, etc.

The total number of cases upon whom tuberculin has been used in the past two years is 72. Of these, 7 were given injections for diagnostic purposes, to exclude tuberculosis, the usual dose being one milligramme; 7 discontinued treatment of their own accord; and 19 are at present under treatment, leaving 39 to be reported upon.

These 39 cases are divided into first-, second-, and third-stage cases—a division that is always more or less uncertain,

but in which the usual boundary lines have been followed—and also into cases that have died, cases that have grown worse, cases that have improved, and cases that have improved greatly.

In the third stage there are 18 cases, 45 per cent. of the whole number, and although most of these were cases that were practically hopeless so far as the possibility of a definite cure was concerned, yet none of them were injured by the treatment, and while some of them did not improve at all and the injections were soon abandoned, yet others made positive gains in the diminution of cough, lessening of fever, and disappearance of night-sweats. This improvement has in some cases even resulted in quite a gain in weight, while the ordinary hygienic and medicinal care of such cases does not result as often even in temporary improvement.

Take, for instance, Case No. 3, who had been under the care of a skilful physician for months when he came to me September 19, 1894. His condition was one of advanced tuberculosis and without hope of any permanent improvement, and yet under small doses of tuberculin, very gradually increased, he gained five pounds in weight, improved in strength, and was in every way much more comfortable in spite of the fact that his financial condition kept him at his desk the greater part of the day. This gain was made from September to December. He held his own in December, but began to lose ground in January, and exposing himself to a severe northwestern blizzard on his way to his office he brought on a congestion of the lungs, was carried home, and died in a few days.

This case shows that the remedy does have an influence upon the course of the disease even in this stage, and the following cases (Nos. 21 and 20) that it is possible for it not only to prolong life but also to open the possibility of usefulness to the sufferers.

Case No. 21, Mrs. S., widow, aged thirty years, lost her father and brother and husband from consumption. Twelve years before she was seen by me in November, 1893, she had

an attack of pleurisy; seven years later she had a second pleurisy, and soon after that a severe turn of "grip." She also had numerous hemorrhages since the grip, which left her with a cough. She had had seven hemorrhages in the previous month, and a daily temperature that varied from 100° to 101°. Her constant cough, free expectoration, and frequent hemorrhages kept her so weak that she was not able to do anything for the support of her needy family. She was put on tuberculin November 29, 1893, and began to improve almost immediately. Before the end of the year she was able to take a clerical position, which she has held ever since, not having taken a vacation or lost ten days in the entire seventeen months. She has been given three courses of tuberculin. The second and third courses were given at times when she was coughing badly and seemed about ready to give up the struggle. Each time the improvement in strength and spirits has been remarkable. She has had no treatment during the past six months.

Case No. 20 was seen in August, 1893, at which time she was having hemorrhages and fever. She dated her bad health from an attack of pneumonia eight years before, since which time she had coughed. She had a cavity in the right apex, and the left apex was infiltrated and full of fine moist râles. Tubercle bacilli were found in the expectoration. Tuberculin treatment was begun August 19, 1893. She has had three courses of tuberculin, and this spring a short course of antiphthisin. She has gained eleven pounds in weight, is at present the mother superior of a teaching convent, and leads a very active life. It has been very unsatisfactory to treat her, because she could not be induced to submit herself to the strict control so essential to success, and all the courses except the first have been practically unfinished. It is very difficult now to find tubercle bacilli in her sputum, but occasionally they are present.

The influence of such cases as these explains the presence of so many third-stage cases in the list. As stated above, there are eighteen of these: seven are dead; only two were

given long courses ; five were given but a trial and the treatment abandoned ; five are worse, one of whom was given but a trial ; five have improved ; and one has improved greatly.

There are eight second-stage cases, of which one is dead, two are worse, one has improved, and four have improved greatly.

There are thirteen early cases, of which one is dead, one is worse, and eleven have improved greatly.

Taking the first- and second-stage cases together, the only cases in which the physician would encourage a patient, we have a total of twenty-one cases, with a mortality of 10 per cent.; 14 per cent. have grown worse, 5 per cent. are improved, and 70 per cent. are greatly improved—figures which certainly look very encouraging. Among the early cases alone, 84 per cent. are greatly improved.

Even with the danger of being tiresome I desire to report still another case that shows tuberculin to be the active agent and not an accidental element, in a very positive manner :

Case No. 18, Mr. B., merchant ; first seen in June, 1894. The disease had begun six years before, in his Eastern home, with hemorrhages. Both apices were involved ; expectoration offensive ; some fever ; tubercle bacilli present. He was treated for six months in the cabinet, and with the ordinary measures. The expectoration ceased to be offensive, but he gained little or nothing in any other direction ; his weight remained stationary. He was then given a long course of tuberculin injections. He improved in every way, and his cough practically disappeared. Tubercle bacilli can only be found by patient search. He gained fourteen pounds and remains well, although actively engaged in business.

Several of the cases reported have been treated with Klebs's antiphthisin, which promises to supplant the crude tuberculin in the therapeutics of consumption. The fever-producing ptomaïnes have been eliminated from antiphthisin, and consequently much larger doses of the active principle can be administered. That this is the case is shown by the increased germicidal action of the remedy in the disappearance of the bacilli from the sputum, and the generally more prompt and satisfactory improvement of the patients.

CLASS A.—FATAL CASES.

Number, name of patient, and name of physician who sent same.	Date of beginning treatment.	Age	Family history as regards tuberculosis.	Personal history.	Condition on beginning treatment.	Treatment.	Date of discharge.	Remarks.
1. Rev. W., priest,	June 4, 1894	29	Good	Had coughed for two years. Quit work in Nov. 1893. Has had hemorrhages.	Third stage. Cavities in left lung, upper lobe; chronic pleurisy at base same side; râles both lungs; fever; tubercle bacilli.	Given small doses of tuberculin for six weeks, with no benefit.	....	Died Jan. 14, 1895. Left-sided pneumothorax developed shortly before death.
2. Mrs. R., widow,	Oct. 1893	55	Bad	Had coughed for sixteen years; began with pleurisy at that time.	Third stage. Cavity in right apex, with fibroid induration to third rib and roughened murmur over entire lung. A few tubercle bacilli.	Given 12 injections of tuberculin in Oct. 1893.	....	Died July 13, 1894.
3. Mr. M., lawyer, (Dr. Wm. Davis.)	Sept.19, 1894	30	Bad	Has coughed since Aug. 1891; pleurisy in fall of 1893. Has had a hemorrhage.	Third stage. Advanced case. Two cavities in left lung; slight infiltration in right lung; hectic.	Given 45 injections of tuberculin.	....	Died Jan. 17, 1895. Gained 5 lbs. to Dec. 1; coughed less. Worked at desk till ten days before death.
4. Sister M., teacher.	Mar. 6, 1894	30	Bad	Has always caught cold easily; has taught until two weeks ago.	First stage. No percussion dulness; respiratory murmur roughened in both apices; lower lobes both sides murmur very weak.	Given tuberculin March 6 to May 9; maximum dose, 1 milligramme.	May 9, 1894	Died Dec. 1894. Improved at first, gained 4 lbs., then lost steadily. Fever began at end of first month. Had no hope or resisting power.
5. Mr. E., insurance. (Dr. G. A. Renz.)	Apr. 24, 1894	29	Good	Been sick since fall of 1893. Potator.	Third stage. Right apex infiltrated to third rib and to spine of scapula; small cavity; rough murmur over right lung.	Given 21 injections; maximum dose, 0.5 milligramme; no improvement.	May 30, 1894	Died September 25, 1894.
6. Mr. F., lawyer,	Aug.15, 1894	32	Good	Had hemorrhages in May, 1892, and May, 1894; coughs every morning.	Second stage. Infiltration in right apex; roughened breathing in right axillary region and under left scapula; no fever. Tubercle bacilli present.	Given 35 injections; maximum dose, 7 milligrammes.	Nov.17, 1894	At end of course, cough and expectoration had disappeared; took no care of himself, and relapsed in Feb. 1895. Died May 6, 1895. Had hectic fever after relapse. Refused to be treated.

7. Miss H., (Dr. E. W. Buckley.)	June 14, 1894	17	Good	Had coughed for a year.	Third stage. Right lung full of moist râles; both apices dull; hectic fever.	Given 15 injections of tuberculin, maximum dose, 0.5 milligramme.	July 20, 1894	Died Sept. 24, 1894.
8. Mr. C., office-boy, (Dr. A. Sweeney.)	Sept. 25, 1894	19	Bad	Taken sick Jan. 1893; has coughed ever since.	Third stage. Right lung dull above clavicle, moist râles to fifth rib; rough but very weak murmur in left apex. Tubercle laryngitis, with infiltration and ulceration; thick dark crusts on walls of trachæ below cords.	Given 13 injections of tuberculin; maximum dose, 0.5 milligramme.	....	Died Feb. 4, 1895. Boy worked to support himself until he drifted into the City Hospital.
9. Mr. S., clerk, (Dr. C. A. Wheaton.)	Nov. 3, 1894	35	Bad	Has coughed every winter for some years; testicle (left) began to swell in June, and was removed in Sept. 1894.	Third stage. Right lung dull to fourth rib; coarse râles in lower lobe behind; roughened breathing in left apex.	Given 50 injections; maximum dose, 45 mgms.; improved, gaining 8 lbs.; desired to return to work in Jan. 1895.	....	Died April 1, 1895. Sank very rapidly in last month of his life; had little or no fever.

Class B.—Cases that have Grown Worse.

Number, name of patient, and name of physician who sent same.	Date of beginning treatment.	Age	Family history as regards tuberculosis.	Personal history.	Condition on beginning treatment.	Treatment.	Date of discharge.	Remarks.
10. Mr. W., lawyer, (Dr. Wm. Davis.)	Oct. 8, 1894	28	Bad	Pneumonia and pleurisy in 1887. Wintered in California; relapsed after typhoid fever in 1893. Had hemorrhages.	Third stage. Entire right lung covered with thick and crepitant pleura; respiratory sounds indistinctly tubular; large coarse râles; heart displaced to right; left lung emphysematous.	Given 40 injections; improved until December, after which hectic came on, and he is now worse.	Jan. 16, 1895	Was obliged to work hard throughout treatment.
11. Sister C., teacher,	Sept. 13, 1893	29	Bad	Has been sick over a year; has lost 45 pounds; has hectic and night-sweats.	Third stage. Both apices consolidated to third rib and spine of scapula; râles in both lungs.	Hectic was controlled by Shurly-Gibbes injections. Tuberculin given in fall of 1893, and spring of 1894, and tried again in spring of 1895.	....	Was very well during summer of 1894, and for almost a year had no treatment of any kind. Relapsed in spring of 1895, and is now worse.

Class B.—*Concluded.*

Number, name of patient, and name of physician who sent same.	Date of beginning treatment.	Age	Family history as regards tuberculosis.	Personal history.	Condition on beginning treatment.	Treatment.	Date of discharge.	Remarks.
12. Sister E., teacher.	Oct. 7, 1893	26	Good	Had coughed for a year, and has had several hemorrhages. Has hectic and night-sweats.	Third stage. Bronchial breathing in both apices, more extensive on left side; fine râles in left axillary region.	Shurly-Gibbes injections for 2 months, which controlled hectic; then tuberculin, three courses.	....	Had acute pleurisy in May, 1894, and subacute pleurisy ever since at intervals. Is growing gradually worse.
13. Sister T., teacher,	May 15, 1894	22	Bad	Has always had winter cough; grew sick in fall of 1893. Has been three years in a convent.	Second stage. Left apex consolidated; roughened breathing in right apex; respiratory sounds absent below fifth ribs and angles of scapula.	Given 44 injections; maximum dose, 0.5 milligramme.	Aug. 1894	Improved in every way during treatment, but has since relapsed and is reported worse.
14. Sister L., teacher of art,	July 16, 1894	27	Good	Has coughed for three years.	Third stage. Dulness over right side of thorax; bronchial breathing and coarse râles over upper lobe.	Treated but one month; maximum 0.08 milligramme tuberculin.	Aug. 16, 1894	Coughed and raised less. Left the city before course was completed. Is reported worse.
15. Sister M., teacher of music,	March, 1894	29	Bad	Had a slight hemorrhage in Oct. 1893.	First stage. Roughness in right apex; weak murmur over back of right lung; jerky breathing third costal space left side.	Tuberculin in spring of 1894, again in winter of 1894–5.	....	Improved very much after first course, less after second course, and now has hectic and is emaciating rapidly.
16. M. G. Nelson, piano cleaner, (Dr. O. S. Pine.)	Oct. 1894	30	Good	Has not been strong for past three years; has had five large hemorrhages in past month.	Third stage. Right apex consolidated to third rib; left apex, breathing rough, and fine râles abundant; hectic.	Hectic controlled; then tuberculin given from Nov. 1894, to Feb. 1895, maximum dose, 45 milligrammes.	March, 1895	Improved greatly; gained in weight, and returned to work, only to relapse. Is now worse.
17. Mrs. Q., widow, (Dr. A. Sweeney.)	Nov. 1893	27	Bad	Grip a year ago has left her with a cough.	Second stage. Right apex dull, tubular breathng; right lower lobe behind, very weak murmur.	Given 31 injections to 2 milligrammes tuberculin.	Jan. 1894	Cough ceased; gained 13 lbs. Nursed her child in typhoid fever, and relapsed. Is probably worse.

Class C.—Cases that have Improved.

Number, name of patient, and name of physician who sent same.	Date of beginning treatment.	Age	Family history as regards tuberculosis.	Personal history.	Condition on beginning treatment.	Treatment.	Date of discharge.	Remarks.
18. Mr. B., merchant, (Dr. A. Sweeney.)	June, 1894	30	Good	Began with hemorrhages six years ago.	Second stage. Both apices consolidated to third costal space; offensive expectoration containing tubercle bacilli.	Hygienic cabinet and general treatment for 6 months; no improvement. Tuberculin for 4 months.	May, 1895	During tuberculin treatment gained 14 lbs.; ceased coughing except a little in the morning. Tubercle bacilli found with difficulty.
19. Mr. H., shoemaker,	July, 1894	24	Good	Began with pneumonia, summer of 1893.	Third stage. Left apex consolidated; râles over entire side; pleuritic friction and creaking around base; roughness in right apex.	Tuberculin given from July to Oct. 1894. and from March to May, 1895.	May 11, 1895	Gained flesh and strength in first course. Coughed a little more and was given a second course. Gain, 11 lbs. Tubercle bacilli have disappeared. Can walk long distances without fatigue or shortness of breath.
20. Sister K., (Dr. Schwyzer.)	Aug. 19, 1893	49	Good	Had pneumonia eight years ago; has coughed since.	Third stage. Was having hemorrhages; right apex consolidated to second rib, with cavity; left apex infiltrated and containing fine râles. Tubercle bacilli present.	Tuberculin given from Aug. to Oct. 1893, Feb. to Apr. 1894, July to Oct. 1894; short course of antiphthisin in spring of 1895.	....	Has gained 11 lbs. Still coughs, and occasionally a tubercle bacillus is found. Is head of convent school and working hard.
21. Mrs. S., widow, stenographer, (Dr. Coon)	Nov. 1893	31	Bad	Pleurisy twelve years ago, second attack five years ago; grip three years ago; constant cough since attack of grip.	Third stage. Pleuritic friction and creaking over entire left lung, with numerous fine râles above spine of scapula and in left apex. Was having very frequent and copious hemorrhages.	Tuberculin given from Dec. 1893, to March, 1894, April to June, 1894, Oct. to Dec. 1894.	Dec. 1894	Weight stationary; great gain in strength. Supports her family, and has since December, 1893.
22. Sister I.,	May, 1894	34	Bad	Began with grip and pleurisy three years before.	Third stage. Right lung dull to fourth rib and to middle of scapula; numerous râles in left apex.	Thirty-seven injections of tuberculin given.	Aug. 1894	Improved greatly in cough. Expectorates but little. Is hard at work.
23. Mrs. K., widow,	July, 1894	28	Good	Always well until about four years ago, when husband died of consumption; has coughed since.	Third stage. Had large cavity in left apex; bronchial breathing in upper lobe; râles in right apex.	Tuberculin given from July to Oct. 1895, and from Mar. to May, 1895.	May 11, 1895	Greatly improved, coughs very little; feels well. A few tubercle bacilli can still be found. Total gain, 16 lbs.

Class D.—Cases that have Improved Greatly.

Number, name of patient, and name of physician who sent same.	Date of beginning treatment.	Age	Family history as regards tuberculosis.	Personal history.	Condition on beginning treatment.	Treatment.	Date of discharge.	Remarks.
24. Mrs. Y., (Dr. Ritchie.)	Feb. 1894	38	Good	Has coughed for several years; begins to feel weak.	First stage. Consolidation right apex to second rib; cog-wheel respiration first costal space left side; tubercle bacilli in the expectoration.	Tuberculin from April to Oct., 60 injections; maximum dose, 30 milligrammes.	Oct. 18, 1894	Gained 8 lbs. No tubercle bacilli can be found.
25. Miss X., (Dr. Bissell.)	Nov. 1893	20	Good	Tubercular abscess in glands in left axilla, followed by pleurisy. Second abscess formed and was curetted, and symptoms of general tuberculosis were beginning.	Third stage. Infiltration in right apex as low as second rib; no sounds below fifth rib or angle of scapula; râles everywhere else over lung.	Tuberculin injections begun in March, 1894, and two courses given during summer.	Oct. 1, 1894	Gained 13 lbs. No tubercle bacilli can be found. Keeps well.
26. Mr. B., (Dr. Nelson)	May, 1894	19	Bad	Has had chronic discharge from ear; had coughed several months. Lost 22 lbs.	First stage. Right apex consolidated to second rib; had fever. Tubercle bacilli in sputum.	Tuberculin; maximum dose, 3 milligrammes.	June, 1894	Gained 14 lbs. No cough; no expectoration. Hard at work.
27. Miss T., (Dr. O. S. Pine.)	April, 1894	22	Bad	Scrofula in childhood. Coughed since the grip, and has had pleuritic pains constantly.	First stage. Consolidation of right apex; right lung but little used; chronic pleurisy over base. Tubercle bacilli in sputum.	Tuberculin injections to maximum dose of 6 milligrammes.	June, 1894	Weight stationary. Keeps well.
28. Mrs. H.,	Oct. 1894	26	Bad	Had coughed for three years, since birth of first baby.	Second stage. Right apex consolidated to third interspace in front and to scapula; roughened breathing in left apex. Tubercle bacilli in sputum.	Antiphthisin (Klebs)—maximum dose, 5 c.c.	Mar. 18, 1895	Gained 13 lbs. No tubercle bacilli can be found. Keeps well.
29. Miss H.,	May 28, 1894	21	Good	Had always been well until hemorrhages came on this spring.	First stage. Respiratory roughness in both apices. Tubercle bacilli present in sputum.	Given tuberculin May 28 to Aug 1.	Aug. 1, 1894	Keeps well. No return of hemorrhages.

30. Miss P., (Dr. A. Sweeney.)	June 23, 1894	22	Good	Has coughed for two months; has lost 25 lbs.	First stage. Diminished respiration in bothsapices, with fine râles in both.	Given one course of tuberculin injections.	Aug.10, 1894	Gained 8 lbs. Has gained since. Keeps well.
31. Miss L.,	Sept. 1894	21	Good	Grip four years ago, since when she has caught cold very easily.	First stage. Roughened respiratory murmur in right apex. Tubercle bacilli present.	Given tuberculin injections to 8 milligrammes.	Mar. 2, 1895	Keeps well. Weight stationary. Tubercle bacilli have disappeared.
32. Rev. M., priest,	Oct. 1894	38	Good	Began with hemorrhage following grip four years ago. A dyspeptic.	First stage. Roughened respiratory murmur in right apex. Tubercle bacilli in sputum.	Given tuberculin injections to 3 milligrammes.	Dec. 15, 1894	Gained 7 lbs. Keeps well; is at work. Tubercle bacilli have disappeared.
33. Mr. M., (Dr. A. Sweeney.)	Oct. 4, 1893	26	Bad	Bad health and hemorrhages due to grip.	First stage. Slight infiltration below right clavicle. Tubercle bacilli present.	Given tuberculin to 1 milligramme.	Jan. 8, 1894	Gained 13 lbs. Keeps well. Is working.
34. Miss N ,	Oct. 25, 1893	35	Good	Has coughed for ten months since attack of grip.	First stage. Fine râles in both apices, more dulness in left.	Given tuberculin in fall of 1893 and fall of 1894.	Oct. 18, 1894	Keeps well. Gained 9 lbs.
35. Sister N., (student of art.)	April, 1894	23	Bad	Has been in bad health for six months; has coughed and often raises blood.	First stage. Fine râles in right apex and dulness to second rib. Tubercle bacilli present.	Given tuberculin injections to 25 milligrammes.	Aug. 1, 1894	Lost 11 lbs. Keeps well and is at work.
36. Miss K., (Dr. Tillier.)	Sept. 1894	25	Bad	Bad health due to typhoid fever; has coughed six months and raised blood.	Second stage. Dulness to third rib right side, with bronchial breathing; friction in right axillary region. Tubercle bacilli present.	Given tuberculin injections to 30 milligrammes.	Dec. 19, 1894	Weight stationary. Keeps well. Tubercle bacilli have disappeared.
37. Mr. S., salesman,	Mar. 1, 1895	27	Bad	Has had hemorrhages at intervals for several years following typhoid fever.	Second stage. Right apex infiltrated to third rib; râles and jerky respiration in left apex. Tubercle bacilli in sputum.	Given 25 injections of tuberculin.	May 15, 1895	Weight stationary; cough disappeared. Tubercle bacilli cannot be found.
38. Mrs. K., (Dr. Coon.)	Feb. 19, 1895	27	Good	Has had winter cough for years. Began to have slight daily fever at Christmas, 1894.	Second stage. Rough inspiratory murmur and fine râles to fourth rib and spine of scapula.	Given antiphthisin to 4 c.c.	Apr. 24, 1895	Gained 6 lbs. Feels better than she has for years. Does not cough.
39. Mr. T., (Dr. Boeckmann.)	Apr. 3, 1895	46	Good	Has been a very hard worker; was debilitated by an acute affection last fall; has coughed since. Spent winter in the South without improvement.	First stage. Right apex infiltrated; left apex roughened breathing. Tubercle bacilli in sputum.	Given antiphthisin to a maximum dose of 7 c.c. in 45 injections.	June 8, 1895	Gained 5 lbs. Coughs but a little in the morning. A few degeneratad tubercle bacilli can still be found.

Personally, I am thoroughly convinced that tuberculin is our most certain remedy for this disease—not, however, that it is or even can be so modified as to become a specific. Its careful use is not dangerous. In beginning cases its use should be encouraged, and in advanced ones without too pronounced sepsis it may be given a trial.

DISCUSSION.

Dr. Beverley Robinson: The use of tuberculin has been before the medical profession now for several years, and we have had excellent opportunity of studying its effects. I think the consensus of men working in the institutions with which I am connected is that no particularly beneficial results can be obtained by this means. This certainly is my judgment and that of several of my *confrères* of wide experience. I believe at the present time it is the opinion of the majority of men working on this particular disease. I was very glad to hear Dr. Taylor's paper; I suppose he will pardon us for, at least, holding our minds in abeyance.

In regard to the medicinal treatment of pulmonary tuberculosis, I venture to say that there are a good many means from which we may obtain, for a period, what seem to be very excellent results. I have seen very excellent results from the method of Dr. Debove, of Paris, of treatment by lavage and gavage; I certainly, in a few instances, have seen patients gain in weight, and at times the pulmonary signs seemed to be modified. We have to consider the digestive organs over and above almost every other point; and no treatment will be of permanent use unless we keep the stomach and intestinal tract in the best possible condition. If I were to pin my faith to any particular treatment, in view of past results, I should say creosote meets with most approbation.

In regard to the mere question of bacilli, I personally do not attribute a great deal of importance to the temporary absence of bacilli from the sputa, as there are ways we can account for this absence. The mere fact of their absence at times should not, so far as the prognosis or curative value of any particular means is concerned, be emphasized too strongly. Dr. Prudden showed, two or three years ago, at the time Dr. Kinnicutt was making his injections of tuberculin, by frequent examinations of the sputa that the number of bacilli differed enormously in repeated examinations, and that really results of very little value could thus be obtained, unless it were by long-continued investigation.

Dr. Babcock: I would like to ask the amount of tuberculin which Dr. Taylor used in these cases.

Dr. C. E. Quimby: I should like to recall to Dr. Robinson's mind a few facts of history. We who were in Berlin came back the last of December; at that time tuberculin had not been tested. I was the first physician to receive a bottle for private practice. The report that was made to the Academy of Medicine was made on the first or second of May; in other words, all those reports were based upon simply five months of use. That use was based upon the methods of the Germans, and at that time they had no appreciation of what tuberculin was or how it was to be used. The condemnation which tuberculin then received was not justified by experience, even if just. Its use in the manner up to that time employed was justly condemned. But so far as I know it has never had a reasonable test in the New York hospitals. It was taken up in ignorance of its action, was given "according to direction," and judged at the end of five months. It has been retained, however, by a few men who were not blinded by the prevailing furor, and, if I am not greatly mistaken, has worked out for itself and been worked into a proper position.

I began its use in 1891 as a local stimulant to tissue activity. As such I have continued its use in appropriate cases. In 1893 Dr. Trudeau showed me cases of healed laryngeal ulcers, in which he attributed the results largely to the use of modifications of tuberculin.

Dr. Robinson: That is always the great difficulty with us all; if you can surround any particular patient with a certain degree of good conditions, you may be able to get very good effects. However, this is very *apropos* of inaugurating hospitals for the cure of tuberculosis.

Dr. Taylor: St. Luke's Hospital, to which Dr. Robinson referred, is a general hospital. These cases were treated in wards with all sorts of patients around, and by the methods adopted when tuberculin was first introduced. In the first place, we cannot accept results obtained in a general hospital as conclusive in the treatment of this disease. It is the last place a consumptive drifts to and his death-knell is sounded when he enters. It is the rarest thing for a consumptive to improve in a general hospital, where there are absolutely no arrangements for his proper care and treatment, such as are used so successfully in the special institutions that are springing up everywhere for the treatment of this class of unfortunates.

In the second place, experience has taught us how to use tuberculin, and shown us that the unfortunate results attending its early use were unnecessary.

In reply to Dr. Babcock, the dose of tuberculin is from $\frac{1}{100}$ to $\frac{1}{20}$ of a milligramme as the beginning dose, and the maximum is anywhere from 1 to 50 milligrammes.

THE TRANSMISSION OF ABNORMAL SOUNDS OF CARDIAC, PERICARDIAC, AND AORTIC ORIGIN A CAUSE OF MURMURS IN THE SUBCLAVIAN REGION.

By ROLAND G. CURTIN, M.D.,
PHILADELPHIA.

I have been studying in an interested way for a number of years murmurs in the subclavian region and their causation. In looking over the literature I was first struck by the apparent inadequate explanation of the etiology of some cases; and the object of this paper is to explain the probable cause of some cases exhibiting this physical sign.

We will first study the symptomatology usually found associated with murmurs in this region. They are acknowledged to be almost always associated with consolidation of the lungs, tubercular, pneumonic, compressed lung, due to pleural effusions or pyothorax. Subclavian murmurs are almost always heard at the left apex or just below the clavicle near the outer end, and sometimes also at the right apex anteriorly. They are said by authors to be systolic; that they are short and usually of harsh quality. They may be intensified by inspiration and weakened or lost in expiration. We find them sometimes accompanied by a thrill; violent exercise increases them; strong, vigorous men are especially prone to have them (those with strong hearts); cases with atheromatous degeneration of the arteries frequently have this physical sign, and they are found in convalescence from acute diseases. Subclavian murmurs are frequently heard in anæmic subjects.

I will quote to you some of the explanations given by prominent writers. Dr. Alfred L. Loomis, in his work on *Physical Diagnosis*, states that "the exact anatomical condition, however, which causes them is still unsettled. Adhesions at the apex of the lung have been suggested; also pressure from pulmonary consolidation at the apex. One thing is certain, that they are more frequently met with in those who are tubercular than in others." Dr. A. E. Sansom, in speaking of the physical cause of arterial murmurs in general, says: "The conclusion must be that the artery is disturbed in its vasomotor conditions, and the pressure upon the integuments but aggravates such disturbance. The immediate consequence of the vasomotor disturbance is that the arterial wall is rendered more prone to vibrate; anæmia, a distinct deterioration of the quality of the blood, is not essential, though a very potent concurring cause. There may be considerable anæmia and yet no arterial murmurs. On the other hand, there may be no notable anæmia and yet a very loud arterial murmur. It is undoubted, however, that in conditions of anæmia the arterial murmur is more frequent and more loud." Another writer ascribes them to small aneurisms in the bloodvessels of the lung tissue (one having been found on post-mortem). I feel assured that there is a class of subclavian murmurs which cannot be explained by the theories advanced by authors on this subject. In this class the sound is conveyed to the subclavian region from distant parts by the better conducting power of consolidated lung or other tissue around the heart and bloodvessels which favors their transmission.

A brief study of the regional anatomy of the heart may assist you in following me in my explanations. The heart is located inside the chest walls, with its right or pulmonary side almost or entirely anterior. The mitral valve is therefore a little to the left side of the median line and about midway between the anterior projection of the vertebræ and the anterior thoracic wall. Therefore we have the mitral valve, the source of mitral murmurs, in the middle of the chest, almost

entirely covered anteriorly by the right side of the heart, the septum, the pericardium, and where the left side of the heart appears in front and to the left is covered by a considerable thickness of lung, and finally by the anterior chest wall. You will perceive that the base of the heart dips back, so that the mitral valve is carried away from the anterior chest wall, so that only those murmurs that are transmitted to the lower part of the heart are heard at the apex. The location of the mitral valve being so hidden by the ventricular wall, it is difficult for a faint murmur to be transmitted to the surface. When the lung in contact with the heart becomes consolidated its conducting power is greatly increased, so that a very faint or an unheard cardiac murmur might be carried high up in the lung that would otherwise be inaudible. In my studies of subclavian murmurs I have heard a presystolic murmur at the apex of the left lung after consolidation had taken place, which was scarcely recognized over the mitral area except after active exercise. I have also noticed in a case of left-sided tuberculosis at the apex a cardiac friction sound which could only be heard occasionally over the heart, and then only while the patient was in a supine position, the supposition being that the friction sound was located on the posterior surface of the heart. In pneumonic consolidation of the lung with exceedingly faint mitral murmurs I have found a similar murmur at the apex of the left lung, disappearing during convalescence; also in cases of purulent and serous effusions in the pleural cavity, where the lung has been adherent and compressed to the anterior chest wall high up.

A small, deep-seated, sacculated aneurism of a large blood-vessel might be transmitted to the subclavian region in the same way as before mentioned. Observations have led me to the conclusion that abnormal sounds faintly heard over the heart or unheard about the body of the heart, especially emanating from the posterior part of the heart, may be transmitted not only to the left apex, but also, in some rare cases, to the right. In corroboration of the suggestions of this paper that some of these subclavian murmurs are due to sounds produced

external to the bloodvessels, I will call your attention to the evidence in favor of the stand I have taken. *First,* in the great majority of cases this murmur is associated with a consolidated lung; *second,* it is generally heard at the left apex or below it; *third,* it is sometimes associated with thrill; *fourth,* violent exercise increases it, probably by exciting the heart and developing murmurs otherwise not present; *fifth,* it is quite frequently in those with hearts increased in vigor by continued heavy work; *sixth,* the fact that this murmur is not transmitted beyond the chest walls into the axillary artery; *seventh,* a degenerated and roughened aorta is often associated with it.

DISCUSSION.

Dr. Richard C. Newton: I noticed these murmurs in several instances in examining recruits for the army. It was at one time my duty to re-examine recruits. I used to believe that the murmurs were due to malformation of the artery or to pressure from adjacent parts. As long as these men were under observation they were in good health. In one case the murmur was only on the right side, and I made up my mind that it was due to some malposition or malformation of the clavicle. It disappeared when the recruit was not excited. After exercise this murmur was very distinct. Probably Dr. Curtin's explanation of the origin of some of these murmurs is the correct one. I used to think that they had a purely local cause.

Dr. Frederick I. Knight: I have never heard a presystolic murmur in that region. It is interesting to note the high location of the murmur in simple dilatation. In the dilatation of chlorotic patients, for instance, the systolic murmur is heard often rather in the pulmonic than in the mitral area.

I have heard many of these murmurs where I could not conceive there had been any organic change—patients who had been perfectly healthy, with history of no acute affection which might have produced adhesions, or anything of that kind, and I have explained them with the platitude of Dr. Flint, that we shall have to consider that there is some alteration in the relation of the vessel to its contents; either there is relaxation of the tension of the walls of the vessel or change in the character of its contents.

Dr. Beverley Robinson: In regard to differential diagnosis I

think everyone of us at times has felt doubt in his mind whether he had to do with a hæmic subclavian murmur or whether he had to do with an aneurismal tumor. These two diagnoses have always been especially before my mind, and I should like to know whether similar difficulties present themselves to others.

Dr. Curtin: The location of the murmur assists very materially in making the diagnosis; also the absence of symptoms and signs of aneurism.

Dr. Robinson: That is true; but it is not invariably true. There are cases where a differential diagnosis by reason of location is not possible.

SOME OBSERVATIONS WHICH APPEAR TO ESTABLISH THE AERIAL TRANSPORTATION OF MALARIAL GERMS.

By RICHARD C. NEWTON, M.D.,
MONTCLAIR, NEW JERSEY.

An interesting paper read before this Society last year by Dr. Wm. H. Daly, of Pittsburg, setting forth the fact that malarial diseases may be and, in Dr. Daly's opinion, ordinarily are disseminated by drinking water containing the germs of the disease, has aroused some discussion and has arrested the attention of a number of medical men.

The controversy as to whether malaria comes from the air we breathe or the water we drink is by no means new. In fact, it is as old as medicine itself. According to Major Smart,[1] Hippocrates believed that the manifestations of malarial disease were due to the use of marshy waters; but Galen and Avicenna recognized the existence of a marsh-poison which contaminated the air. In 1831, Orton,[2] in his work on *Cholera*, instanced the unenlightened state of the Hindoo mind, inasmuch as they believed that malarious diseases came from bad drinking water. Sir Joseph Fayrer[3] also mentions this belief of the natives of India in his celebrated Croonian lectures of 1882, and adds that they also believe that the milk of buffaloes or cows pastured in places overflowed by waters containing the malarial poison has the same effect in producing the disease as the waters themselves. As we are not informed of the dairy methods of the Hindoos, we cannot judge whether the milk may be contaminated by water subse-

quently to milking or not. We infer, however, that it may become noxious in this way.

The case of the soldiers on the transport "Argo," in the year 1834, recorded by M. Boudin,[4] is familiar to most of you, and clearly shows that the cause of the outbreak of malarial fever upon the vessel was the marsh water, which those affected drank, and which those who escaped the fever did not drink. And so strong was the chain of evidence in this case that M. Colin,[4] who was convinced that malarial infection was solely conveyed by the air, was obliged to dispute the diagnosis and assert that the fevers were cases of typhus—a quite unwarranted assumption.

Many observers, especially Sir J. Fayrer,[3] Surgeon E. G. Russell[1] (in his work on *Malaria and Diseases of the Spleen*, Calcutta, 1880), Hehir,[5] Sternberg,[6] Smart,[7] Parkes,[4] Moore,[1] (*Diseases of India*, London, 1861), agree that the malarial poison may enter the system with the drinking water. Dr. Smart[7] refers to the great improvement in the health of the garrison at Fort Brown, Texas, especially in the matter of malarial diseases, since a better water-supply has been obtained and the troops no longer drink the Rio Grande water. Dr. M. K. Taylor[4] made similar statements with respect to Fort Sill, Indian Territory, in a paper read before the International Medical Congress at Washington some years ago. Dr. Richard Waggoner,[7] of Pensacola, Fla., gives a number of instances which show that the malarial diseases in his neighborhood depend upon the drinking water. Cases like those of Dr. Jones,[6] recently reported, of Drs. Norburg,[6] Lewis,[7] Daly,[6] Lumsden,[6] Boyker,[6] etc., show undoubted contamination of the drinking water and the propagation of malarious disease by this means.

Professor Bemis,[23] of New Orleans, has shown that the poison of malaria may live in the water an indefinite and undetermined time, and be conveyed by water currents through immense distances and even to remote islands and continents. Smart[4] tells us that the disappearance of malarial disease from a locality has evidently been often associated with the

substitution of percolated water for surface supplies. The Terrai, a belt of marshy country lying along the base of the Himalaya Mountains, has recently been reclaimed and made habitable by the use of deep wells. The testimony shows that in this tract the chief cause of the malarial fevers lay in the surface waters which had been used as a drinking supply. Parkes[4] says: "One very important circumstance is the rapidity of development of malarious disease and its fatality when introduced in water. It is the same thing as in the case of diarrhæa and dysentery. Either the fever-making cause must be in larger quantity in the water or, what is equally probable, must be more readily taken up into the circulation and carried to the spleen than when the cause enters by the lungs."

Dr. von Wedekind,[6] U. S. Navy, states that it is a common practice for medical officers serving on the West African coast to forbid entirely the use of the "land water" as a beverage by the men under their charge, which might seem to some a reversion to the unenlightened state of mind noticed in the Hindoos in 1831.

Hertz[8] says that in colder climates, Germany, the Netherlands, Russia, etc., malarial fevers most commonly appear at the time of melting snow. Dr. Smart[9] showed that the malarious diseases affecting the troops at Fort Bridger, Wyo., increased in direct ratio with the organic impurities of the drinking water, and were especially prevalent when melted snow water found its way into the stream from which the drinking water was derived.

My friend, Dr. Atkins, of East Las Vegas, New Mexico, noted, in the spring of 1894, a violent dust-storm passing from Deming, New Mexico, to the Raton Mountains. He says: "After the storm had raged all day in the Rio Grande Valley it was curious to see at 5 P.M. the very fine dust sailing high over the mountains west and southwest of Las Vegas coming from all New Mexico southwest of us. In such a way our water might have been affected."

The doctor had been suffering with a severe chill and fever,

contracted, as he fancied, from the drinking water. He says further: "In Las Vegas and vicinity we have absolutely no malaria, no low or marshy places, but at Albuquerque and other Rio Grande points it exists." He also adds that the seasons of 1893 and 1894 had been unusually wet, after six or seven years of heat and drought, and in the fall of 1894 a few cases of what were apparently malarial fever and of typhoid fever, the first in three or four years, were noted. His conjecture of the aerial contamination of the water-supply of Las Vegas, which comes from a pond on the side of the mountain, over which the dust-storm blew, is reasonable and probably correct, although the pond water used for drinking might have been contaminated by the heavy rains. Rains after droughts are universally prone to cause malaria whether swamps or bogs are near by or not, and they probably do this by sweeping organic matters into the water-supply. It is said by some, however, that these rains wash the malarial germs out of the air into the water.

Smart[4] also mentions the fact that malarial hæmaturia, hemorrhagic malarial fever, etc., are prevalent in winter when atmospheric malarial exhalations could not be expected, and states that remittents and so-called typho-malarial fevers may occur when the temperature is below zero, and therefore must be supposed to come from the drinking water.

Those of us whose practice lies in a growing community, where a public water-supply has been recently introduced, have all, I presume, noticed cases of disease of a malarious nature, the victims of which were still drinking from the "best well in town." Without referring to my case-books, I can recall a number of instances in which "malaria" disappeared from a household just as soon as they began drinking the "town water" and gave up the ancestral well. Dr. Whitehorne, of Verona, New Jersey, called attention some years ago to the increased freedom from malarial diseases enjoyed by the inmates of the City Home, a correctional institution of Newark, New Jersey, since they had ceased drinking surface water. Dr. Harvey, in the same discussion, stated

that, in his experience, malaria comes from the drinking water. Whether my cases above mentioned were true malarial diseases or not, I, for one, am somewhat doubtful. It is a very fortunate thing that the fact of the existence of the plasmodium in every case of true malarial poisoning seems to be proved. And it is to be hoped that the recent reports that each of the commoner forms of malarial fever has its distinct plasmodium will be verified. With this aid to diagnosis, the nature of many an obscure affection will probably be made manifest, and intelligent direction will be furnished for the action of health officers and sanitarians in the matter of water-supplies, drainage, etc.

The writer agrees with Dr. Daly,[6] so far as this, that the text-books do not as rule sufficiently emphasize the fact of malarial infection from drinking water. It is, perhaps, needless for me to remind you, however, that the probability of the aqueous spread of malaria is mentioned in Reynolds's *System of Medicine* (Dr. Maclean), Hare's *Therapeutics* (Dr. Dock), Pepper's *American Text-Book* (Professor Whittaker), Ziemssen's *Cyclopædia* (Hertz), Loomis's *Practical Medicine*, Bristowe's *Theory and Practice of Medicine*, Pepper's *System of Medicine* (Ed. 1884), Niemeyer's *Text-Book of Practical Medicine*, *The Medical and Surgical History of the War of the Rebellion*, and turning to the writings of that noble clinician, Dr. George B. Wood, we read (*Practice of Medicine*, part i. chap. ii.), "It is not impossible that they (the malarial miasmata) may be absorbed through the skin and even through the mucous membrane of the stomach, which they may enter with the saliva."

The writer remembers instances during his army service in New Mexico in which the consumption of watermelons seemed to be provocative of malarial disease. I only mention this in passing, because Dr. Daly lays so much stress upon the chance of malarial poison being taken into the system by eating spinach, lettuce, and other fresh vegetables which may have been washed in marshy waters and may have the germs adhering to their surfaces. The possibility of the communi-

cation of malaria by the latter means or by the juices of fruits or melons grown in malarial soils is a question requiring further investigation. Dr. Cadwallader[6] states that drinking the sap of the sugar-maple and eating sorghum molasses are probable sources of malarial fevers, and Hertz and others warn travellers against eating watery fruits while in malarious countries. Dr. Daly, in the paper referred to, seems to lay great stress upon the fact that he and his comrades were able to remain in the swamps for considerable periods without contracting ague, so long as they did not drink the marsh water. And the inference which he seems to wish to be drawn from this fact is that the air of the swamps does not contain malaria, and that, therefore, there is no aerial transmission of malaria. There is one fallacy in the doctor's position which he seems to have overlooked. The comparative immunity of those dwelling in swamps from chills and fever has been a matter of comment and, I may say, of surprise, for a number of years. At any rate, Sir Thomas Watson noted, in his admirable lectures, the fact that among the inhabitants of the Dismal Swamp malaria is never seen. Aitken[11] says: "It must also be admitted, however, that these diseases do not prevail in all marshy districts." Dr. George H. Horn[12] reports an absence of malarial disease at Camp Independence, California, where every supposed factor for its propagation existed. Osler[13] says that it is impossible to tell from the soil whether a place is malarious or not. Sternberg[19] said, in 1883, that there is still a factor in the development of malaria with which we are unacquainted and whose precise action we can only surmise.

Smart says that owing to local causes the vicinity of a marsh may not be an insalubrious locality, and in another place says that a swamp or marsh is not needed for the development of malarial diseases.

Singapore is a place whose freedom from malaria can be explained only by assuming that there is not sufficient change either daily or annually in the temperature to produce the radiation of heat necessary to set the malarial germs in motion.

Dr. Baker (Hare's *System of Therapeutics*, vol. i. p. 536) tells us that "in many countries, through draining the soil, clearing of forests, and *other measures tending to reduce the difference between day and night atmospheric temperature*, there has been a very great reduction in the sickness from intermittent fevers."

The Amazon River, and many marshy localities in Australia, New Zealand, New Caledonia, South America, and the Bermudas are mentioned as free from malaria, where the contrary would be expected.

Rusby[6] observed that in travelling in South America there is little danger in sleeping near stagnant pools, but that a sojourn near running streams or waterfalls was almost sure to be followed by a malarial seizure. The editor of the *Medical Record* in commenting upon this observation says: "This would seem to argue in support of the theory advanced some time ago that the malarial poison is carried by running water from wooded regions, and that marshes are not its natural habitat."

Hertz[8] says: "Instances occur every now and then in which, with every condition present for the development of malaria, this poison is entirely lacking. We cannot account for these exceptions unless it be on the ground of the disinfecting proportion of ozone, which is said to be largely developed in some marshes."

If, then, the atmosphere of certain marshes is free from malaria, may not Dr. Daly and his friends have been hunting in such a marsh, and hence escaped the miasma as soon as they desisted from drinking the water?

Having now considered the question of its aqueous transmission of malaria, we turn to that of its aerial transmission. As hinted in the early part of this paper, belief in the latter proposition has always existed.

Pliny[1] noted the fact that trees destroy or consume mephitic vapors, and Galen and Avicenna recognized the existence of aerial contamination with marsh miasmata. Lancisi[10] in 1695 published his *De Noxiis Paludum Effluviis*, in which

he proved the aerial origin of malarious disease, and this work was for years the great authority upon the subject, and still has an effect upon the medical mind.

Tomasi Crudeli,[3] than whom probably no man living has made a more extended study of the natural history of malaria, showed a number of years ago that a perpendicular elevation of fifteen or twenty feet will stop the malarial current, but an object of the same height with inclined or sloping sides is not efficacious in arresting the passage of malaria. The same authority[15] also points out that people sleeping on platforms three or four metres from the surface of the ground are comparatively safe from malarial disease. He also directs that the air of the morning and early evening hours be rigidly excluded from dwellings, especially if any excavation may be going on in the neighborhood. If possible, air to ventilate the house should not be taken from near the ground, but should come from a higher stratum. Flowers should also be rigidly excluded from houses in malarious regions.

Dr. W. O. Daniel[16] recommended keeping the doors and windows shut as much as possible between sunrise and sunset, and states that excellent results have followed the execution of this plan.

Dr. John M. Ward,[6] Superintendent of the New Jersey State Lunatic Asylum, observed no case of malarial fever among six hundred and seventy-two inmates of the institution, all of whom were kept in-doors after sunset, whereas the laborers and assistants in the asylum, who were not so restricted, suffered with such diseases. Hartshorne[20] noted that the in-door operatives in factories in miasmatic regions enjoyed comparative immunity from malarial disease.

Dr. George B. Wood[17] stated that he was physician to a public institution containing more than one hundred inmates, among whom, during sickly seasons, autumnal fever was very prevalent until the order was enforced prohibiting anyone from going out of doors before breakfast or after tea. We are told that screens or mosquito-nets will exclude malaria as well as insects.[3]

Stanley, in his well-known work *In Darkest Africa,* says that Emin Pasha always took a mosquito-curtain with him, as he believed that it was an excellent protector against the miasmatic exhalations of the night.

Stanley also says: "While ascending the Congo with the wind astern we were unusually exempted from ague. But descending the Upper Congo facing the wind, we were smitten with most severe forms of it; while ascending the Aruwini, we seldom thought of African fever, but descending it in canoes, meeting the wind currents and carried toward it by river flow and paddle, we were speedily made aware that acclimatization is slow." The Amazon[14] is also free from malaria, compared to its tributaries, which fact is explained by the assertion that a wind constantly blowing up the wide stream from the sea tends to equalize the day and night temperature and to obviate the nocturnal radiation of heat. Another explanation might be that the seabreeze drives back or neutralizes the malarial germs contained in the land breeze. The Orinoco[14] in South America, is a notoriously malarial stream and its great cataract is by far the worst portion. This cataract is surrounded by bare, black rocks, and the radiation of heat is extreme. It is also true that the spray is dashed high and the malaria, originally in solution in the water, may be disseminated through the air by mechanical means as well as by the heat radiation. This view of the writer is confirmed by the opinion of George B. Wood,[14] who says: "the atmosphere may be impregnated with malarial poison by the spray of water in motion."

I might observe here, in passing, that the view seems to be daily gaining ground that malarious waters are often made so by the washing down of the malarial germs of the air into the water. Combe's[18] experiments lend color to this view. He asserts, after four years' observations, that a light rainfall lasting but an hour will purify the air completely of bacteria and that after a snowfall of half an hour the atmosphere remains completely freed from bacteria for a considerable time.

Smart[1] believes that rainfalls carry down the malarial germ

from the air, and George B. Wood thought and many others believe that malaria comes down with the dew.

It has been known since the time of Hippocrates that fires at night are an efficient means of keeping off malaria, their prophylactic action being due either to the prevention of the dew or to the creation of artificial currents of air and the intercepting of the established currents.

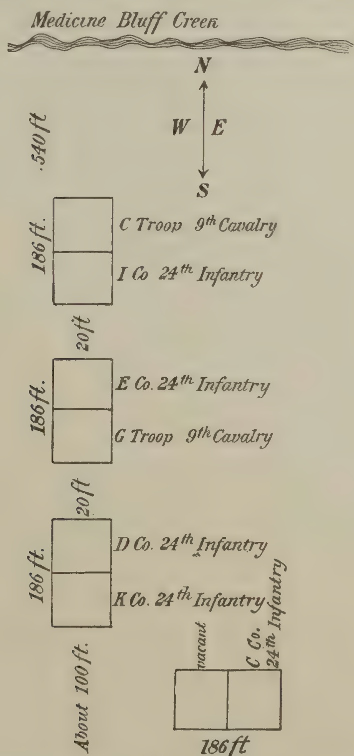
The fact of the carriage of malarial germs for long distances in the air is commonly believed by medical men living in malarial regions. Smart[4] says: "Medical men of the Mississippi Valley are of the opinion that during an especially unhealthy season the miasma from the river bottom affects persons living on the generally healthy uplands twenty or thirty miles inland from the eastern shore, but not on the western side. This is accounted for by the direction of the wind, which blows generally across the valley from the west."

Maccullock thought that malaria was blown entirely across the English Channel from Holland.

In another place Smart says that it is well known that the insalubrity of Sierra Leone is due to the winds from the Great Bullam Swamp. The windward side of most swamps is wholesome and the leeward may be if there be an obstacle to the air currents.

I do not believe it desirable to take up your time with further quotations tending to show the aerial transmission of malaria. But, if you will pardon me, I will add a few of my own observations to those already given. I will quote from a paper which I published in the *Medical News*, Philadelphia, of July 5, 1884: "The writer became post-surgeon in this post (Fort Sill, Indian Territory) in the latter part of February, 1883, and was relieved from this duty November 20, 1883. During this period (about nine months) he attended 'sick call' himself (with less than two dozen exceptions) and took entire charge of the cases in the hospital. He therefore is certain that all the cases diagnosticated as malarious received antiperiodic treatment, and believes that the diagnoses were correctly made. . . . Without doubt the

hygiene of this fort is execrable, owing to the clayey soil and rank vegetation and to the disregard of every hygienic law evinced by the builders of the barracks. . . . All the barracks for the men are substantially similar. The accompanying diagram will show the disposition of these buildings as regards the creek, from which our water-supply comes, and the points of the compass. Each building is one hundred



and eighty-six feet long and is divided equally by a transverse partition, each half accommodating one company of soldiers. The distance from the shore of the creek to the northern end of C Troop's, Ninth Cavalry, quarters is five hundred and forty feet. A passageway of about twenty feet separates the two buildings, which run north and south, from each other.

Nearly a hundred feet farther south is the barrack of C Company, Twenty-fourth Infantry. 'Medicine Bluff Creek' is a stream of varying volume ; the water has always more or less vegetable matter suspended in it. When the stream is swollen it widely overflows its banks, and, subsiding, deposits great quantities of dead leaves, grass, etc., in varying stages of decay along the banks, and even in the forks of trees and tops of bushes. The creek water is hauled about the post in a 'water-wagon,' and distributed for drinking and culinary purposes. It is kept in clean barrels and other receptacles.

"The garrison of this fort is composed of six companies (until October 8th last there were seven) of colored troops. The prevailing wind is from the south. The next most frequent wind is the north wind, called here 'Norther.' It is always much colder than its opposite, and is popularly believed to bring more malaria. The direction of the winds at this post for the years 1880, 1881, and 1882, taken from the observations of the signal office here, are as follows (three observations daily):

1880.		1881.		1882.	
Direction.	No. of observations.	Direction.	No. of observations.	Direction.	No. of observations.
N.	247	N.	228	N.	294
N.E.	102	N.E.	58	N E.	58
E	43	E	73	E	78
S.E.	227	S.E.	106	S.E.	122
S.	215	S.	376	S.	331
S.W.	74	S.W.	41	S.W.	59
W.	11	W.	22	W.	21
N.W.	158	N.W.	96	N.W.	96
Calms	121	Calms	95	Calms	95

"Very soon after beginning to attend 'sick call' the preponderance of cases of sickness from certain companies excited my curiosity; and a little reflection led to the belief that the position of the various company quarters, with refer-

ence to the creek, had some connection with the number of cases reported sick from that company. Accordingly the following tables were prepared :

TABLE I.—*Showing whole number of cases of sickness from each company in the garrison for nine months, and whole number of days of sickness.*

	Cases.	Days.
C Troop, Ninth Cavalry	71	231
I Company, Twenty-fourth Infantry	48	168
C Company, Twenty-fourth Infantry	44	139
E Company, Twenty-fourth Infantry	39	115
K Company, Twenty-fourth Infantry	28	82

"D Company, Twenty-fourth Infantry, left this post for another station October 8, 1883, and G Troop, Ninth Cavalry, was 'in the field' for nearly four months. To make Table I. more complete we have

TABLE I. A.—*For seven months.*

	Cases.	Days.
C Troop, Ninth Cavalry	51	152
I Company, Twenty-fourth Infantry	35	124
C Company, Twenty-fourth Infantry	32	100
D Company, Twenty-fourth Infantry	28	91

TABLE I. B.—*For five months.*

	Cases.	Days.
C Troop, Ninth Cavalry	21	57
C Company, Twenty-fourth Infantry	17	44
E Company, Twenty-fourth Infantry	12	34
G Troop, Ninth Cavalry	12	29
K Company, Twenty-fourth Infantry	9	29
I Company, Twenty-fourth Infantry	8	22

TABLE II.—*Average duration of cases.*

	Days.
C Troop, Ninth Cavalry	3.25
I Company, Twenty-fourth Infantry	3.50 (or 3.02)[1]
D Company, Twenty-fourth Infantry	3.25
C Company, Twenty-fourth Infantry	3.16
E Company, Twenty-fourth Infantry	2.94
K Company, Twenty-fourth Infantry	2.92
G Troop, Ninth Cavalry	2.16

[1] A case of typho-malarial fever which terminated fatally after six weeks in the hospital, and which was the only case of continued fever during the period, might, I think, be fairly left out in computing I Company's average sickness.

"There are variations in the number of enlisted men in a company. The full strength of a troop of cavalry is sixty-six, of a company of infantry fifty. The mean strength of any company varies constantly from enlistments, discharges, sickness, 'detached service,' etc. In Table III. the percentage of cases of sickness to the mean strength (*i. e.*, men actually on duty) is shown :

TABLE III.—*Percentage of men sick with malaria in nine months.*

C Troop, Ninth Cavalry	138 per cent.
I Company, Twenty-fourth Infantry	128 per cent.
C Company, Twenty-fourth Infantry	118 per cent.
E Company, Twenty-fourth Infantry	106 per cent.
K Company, Twenty-fourth Infantry	68 per cent.

TABLE III. A.—*Percentage of men sick with malaria in seven months.*

C Troop, Ninth Cavalry	98 per cent.
I Company, Twenty-fourth Infantry	94 per cent.
C Company, Twenty-fourth Infantry	89 per cent.
D Company, Twenty-fourth Infantry	71 per cent.

TABLE III. B.—*Percentage for five months.*

C Troop, Ninth Cavalry	38 per cent.
I Company Twenty-fourth Infantry	20 per cent.

TABLE III. C.—*Percentage for one month.*

(Sept., 1883. The most sickly.)

C Troop, Ninth Cavalry	46 per cent.
I Company, Twenty-fourth Infantry	34 per cent.
E Company, Twenty-fourth Infantry	30 per cent.
C Company, Twenty-fourth Infantry	20 per cent.

Mean strength of the command for the period, 277.

Total number of malarial cases 269, or 97 per cent.

Total number of days' service lost to the government by malarial sickness among the troops, 855.

Average duration of all cases, 3.02 days.

"A comparison of the tables and diagram will show that the number of cases of sickness and days of sickness increase in each company in direct ratio to its proximity to the banks of the creek, with the single exception of C Company, Twenty-fourth Infantry, which holds the third place in Table I., the

fourth in Table II., and the third in Table III. Why? Obviously because the barracks of this company lie directly across the course of the north wind, and, in consequence, present a greater surface to the air currents than those buildings whose long axis is parallel with the direction of the prevailing winds (*i. e.*, north and south). Were the south wind as unwholesome as the north, K Company, Twenty-fourth Infantry, would have the same average of sickness as C Troop, Ninth Cavalry, but not so great as C Company, Twenty-fourth Infantry (since the latter's quarters, as has just been explained, present a greater surface to the prevailing wind). Leaving out of consideration C Company, Twenty-fourth Infantry, we observe the singular fact that there is a regular gradation in the number of cases of sickness in each company, per cent. of cases to mean strength, and days of sickness, as we recede from the creek.

"If anyone still adheres to the theory of malarial disease so ably advocated by Oldham,[22] he might say that the north wind being, as has been stated, so much colder than its opposite* might bring malarial disease into the post by chilling the soldiers. To which the obvious reply is that it is inconceivable that a distance of one hundred feet farther north or south would make such a difference in the temperature of the wind as to have any effect upon those cases of sickness alleged to be caused by the wind.

"I am aware that some remarkable instances have been recorded of the growth of a line of shade trees, or the removal a few hundred yards of dwelling or barrack, stopping malarial fevers. But no observations of bodies of men alike in age and condition, eating the same food, drinking the same water, wearing similar raiment, and performing similar duties, have shown, so far as I know, that a difference of residence of less than one hundred feet from the banks of a stream will make a difference in the number and intensity of cases of sickness occurring on the same days. The banks of the creek afford

* Without being able to collect precise data, it is quite safe to say that the fall of temperature will exceed 20° F. within two hours of the setting in of a "Norther."

all the supposed factors for the production of malaria, and to my mind the proof is satisfactory that the miasma was produced at the stream and brought into the post by the north wind. This miasma must, as has been pointed out by various observers, soon lose its potency in the air; or, what would have the same effect, may very soon be precipitated and fall to the ground, otherwise at Fort Sill, C Company, Twenty-fourth Infantry, would have the highest instead of the third place in the tables, since their exposure to the noxious wind is greater than that of any of the other companies.

"The blacks seem about as liable to malarial poisoning as the whites in this garrison, although it should be stated that, owing to the small number of white men in and about the post, a fair comparison of the relative susceptibility of the Caucasian and Negro races could scarcely be made.

"The amenability of the blacks to treatment was, however, quite marked, as the average duration (3.02 days) of the malarial attacks and the slight mortality (only one fatal case) among them shows."

In conclusion, then, I think we may say that both sides of the question—*i. e.*, the aerial and the aquatic transportation of malarial germs—have been proved. A controversy upon the subject would repeat the celebrated duel of the two knights over the bimetallic shield.

I think it fair to assert that in places ordinarily non-malarious the drinking-water is probably the more frequent cause of ague, when it does appear, than the atmosphere, certain conditions, which we cannot always explain, but which are often, as in case of the water-supply of Las Vegas, mentioned above, quite explicable, impregnating the water. But in places like the Campagna of Rome, the Orinoco River in South America, and the jungles of East India, where malaria is so constant and so deadly, the atmosphere is the usual method of its transportation.

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DISCUSSION.

Dr. Thomas D. Coleman: I have been much interested in Dr. Newton's paper. I should not be willing to affirm that malaria is never transmitted by means of the air, but, I believe, it is comparatively rare compared with the transmission of it by means of drinking-water. I think that in many instances where the infection is supposed to have taken place through the medium of the air, the sources of the drinking water are not sufficiently considered. In the case of the sailing vessel anchored four miles from the shore, which Dr. Loomis relates in his text-book, that when the wind changed and blew from the shore malaria broke out among the crew, I think it would be very important to know the source of the drinking water of that crew.

In certain regions of Georgia, with which I am acquainted, malarial regions have been entirely transformed by the introduction of artesian wells. I know of two plantations where it was almost impossible for white families to live prior to the introduction of artesian well water for drinking purposes. The negroes persist in drinking the surface well water and suffer greatly from malaria. In the white families using artesian water malaria has been absent for a number of years.

I should like to ask Dr. Newton the percentage of hæmaturia. My experience is that one finds a hæmoglobinuria rather than hæmaturia.

DR. THOMAS DARLINGTON, JR.: I believe that malaria is transmitted in both ways, although the larger percentage of cases is by water. In the upper part of New York City streets were laid out years ago, now they are being graded. In many of these streets Croton water was put in when they were first laid out, and the pipes have not been disturbed in the grading. Nevertheless, the occupants of the houses have nearly all acquired malaria by inhalation from the turning over of the soil.

Again, in a family where I had some cases of scarlet fever, two cases were isolated in a room connected with a conservatory; these patients acquired malarial fever while recovering from scarlet fever. Other persons in the house did not have malarial fever, but on being transferred to this room they immediately acquired it in the intermittent form.

DR. G. HINSDALE: I think it is interesting to note the transmission of malarial poison in the history of the epidemics we have had in this country, particularly about New York City and the adjacent portions of New Jersey.

Along in the forties, I believe, there was such an outbreak. Later it progressed up the Hudson River until it reached Albany; it proceeded eastward along the sound past New Haven, and even to Newport, finally, on to Massachusetts; it progressed in a northerly direction along the Housatonic and Connecticut River valleys. It is interesting to note the progress of malaria from its initial point in the marshes between Newark and Jersey City, to the head waters of the Housatonic and the upper Connecticut.

In New England, in still earlier days, the civilization of the country involved the cutting down of a large amount of timber and the establishment of saw-mills. There was an overflowing of the streams in the neighborhood of these dams; and the poison then appeared in the neighborhood of these mills and the flooded country. This involved the decay of a great deal of vegetable matter, the rotting of bark and other vegetable substances; these flooded areas became exposed again to the sun. Soon, at various localities, there was malarial fever from this cause. After the soil had sufficient time to dry, and after the abandonment of these mills, and the return of the streams to their natural beds, the disease became less prevalent. Whereas it was common, twenty, thirty, or forty years ago in New England, it is now, in certain parts a great rarity.

If you look in Dr. Oliver Wendell Holmes's essay on intermittent fever you will find the records of a great deal of intermittent fever in New England, and he reports cases as far, I think, as Nantucket, outcroppings of cases, not, perhaps, due to the same cause I mentioned, but nevertheless due to the generation of the disease from the poison which originally lay in the soil.

In reference to the Dismal Swamp, which has been mentioned, I do not think we realize just what the character of the swamp is. I have had information from special surveyors to the effect that the interior is not unhealthy. The water is not so stagnant as is commonly believed, the juniper growth is believed to exert a good influence on the purity of the water, although it gives it a dark color. It is a wonderful place for game.

I may also refer to the investigations of Dr. Peyre Porcher, of South Carolina. He was strongly of the opinion that the poison of malaria was prevented by the use of nets and screens, to keep out the night air.

Dr. Beverley Robinson: I would like to add my testimony to the value of this paper. It is a most admirable exposition. There are a few facts that have a certain bearing upon this topic, which, however, have no direct relation to this paper. The diagnosis of malaria in hospitals is one thing, and in private practice often quite another. As I understand the subject, in hospitals we want to find the malarial germ, if we can get it. Then, if we cannot find it after examination according to the most approved methods, we make a physical examination. If we find an enlarged spleen, and in connection with it a tolerably correct clinical history, we believe in the existence of malaria. But in private practice we often apply the term malaria to certain indefinite obscure manifestations.

In regard to the origin or source of what may or may not be called malaria, one is, I believe, the water that comes through very old pipes. I have noticed time and again with the Croton water coming in New York houses, where the plumbing was old, the same persons had manifestations which I might properly designate malarial.

In regard to the transportation of malarial germs, I am undoubtedly of the opinion that they may be brought through the air, carried directly from the surface of the soil, or transported in the furnace air which comes from near the surface of the ground, and close to areas, gutters and sewer openings.

There is a matter to which I should like to call attention. I have known several instances in individuals (in private practice) where the blood in New York had been examined most carefully by experts and no malarial germs were found. Those same persons have gone to reside in Newport or in some other seaside resort, and they have there immediately developed malaria characterized by the presence of special germs. The treatment of these cases was successful by means of anti-malarial agents. Some three summers ago Dr. Siegfried, of the United States Navy, who is a very expert microscopist, was willing to examine the blood of some of these patients for me. In it he found malarial germs of different forms.

Then there are cases apparently susceptible in regard to malarial

poison, for which we have no absolute scientific justification in blood examinations.

In regard to the question of treatment, singular to relate I have in my pocket at the present time two letters from physicians, one from Dr. Bradshaw, of Orange, N. J., and one from a Dr. Grafström, of New York City, also a letter from Dr. Cleveland, of New York, in regard to the use of compound tincture of bark in the treatment of cases to which I refer, in substantiation of the fact that the use of the bark is frequently repeated; tolerably large doses had been undoubtedly most useful. In the case of Dr. Bradshaw the patient was thought to be phthisical; we tried the bark, and that gave relief. In Dr. Grafström's own case the bark broke up a supposed instance of typhoid fever.

It is my conviction that you cannot always control malarial poison by the use of the time-honored drug quinine. I think we make a great mistake to put so much reliance upon large doses of it. It is better to go back to the use of the bark itself; it is in this way we shall get the best curative effects.

Dr. J. Daland: I should like to thank Dr. Newton for his valuable paper. It is quite proven that the malarial poison can be transmitted by air and water.

Dr. Robinson's theory of the development of the poison in pipes leading to houses accounts for outbreaks in large cities and different localities, and suggests a valuable series of experiments.

I have never yet been able to isolate the malarial poison outside the human body.

It seemed to me that one of Dr. Robinson's cases might be explained in two ways: First, perhaps malarial poison is due to a number of micro-organisms; and second, the cases that were looked at, at the time probably presented the ameboid form of the organism, and, under the most favorable circumstances, the best of observers will overlook them. But if the preparation of blood is stained with methyl-blue, the ameboid body is easily detected. I have had the greatest difficulty with this particular ameboid body.

In regard to the development of the disease after leaving the locality it would seem that these patients have malarial poison, in a measure imminent, but when removed to another locality the malarial parasite grows through its late cycle with renewed activity.

With regard to the bisulphate of quinine given in full doses, although it may relieve the symptoms, the malarial body *may* still exist in the blood.

I observed a case of typical intermittent fever not long ago where all of the symptoms yielded upon the administration of 28 grains of quinine in twenty-four hours. The patient expressed himself as feeling perfectly well. A re-examination of the blood, however,

showed the presence of a large number of crescentic bodies and a few pigmented malarial bodies. The quinine was therefore increased to 40 grains in twenty-four hours, and in a few days his blood showed no malarial parasites, and he was discharged from the hospital. Personally, I have little doubt that but for the specific treatment he would have returned sooner or later to the hospital.

Dr. Newton: We have much to learn about the plasmodia, their life, history and method of propagation. We do not know how long it takes to generate these bodies in the blood. And again we do not know what was in the receptacles that held the drinking water. A Brooklyn observer claims to have isolated the germs from the water which supplies the inhabitants of that town. There may be conditions which develop the plasmodia in water under very different circumstances, or matter which elaborates something in the drinking-water which causes the plasmodia to appear in the blood.

Like Dr. Daland, I have seen very little hemoglobinuria that was due to malaria.

I would like to mention one case that was very interesting, of which I have been reminded by something just said: A British naval officer reported in the *Lancet* some years ago that he had contracted malarial fever, while serving in Africa, from an exposure to noisome effluvia from a heap of decayed vegetation. He was overpowered by the odor and felt sick and dizzy. He withdrew from the spot, and a few hours afterward had a severe chill followed by fever and sweating. He took anti-malarial remedies. The chill, fever, and perspiration recurred in a milder form on the third day, and it was sometime before he completely recovered his health. I have known undoubted cases of typhoid fever due to having drunk infected milk once, and doubtless cases of malarial fever due to a single exposure have been reported. Although, from the nature of the infecting agent, single exposures must be rare, and hard to demonstrate when they do occur, I do not now recollect having met one in my own practice nor of having read of any except the one just quoted.

TWO FACTORS UNDERLYING DISEASE IN NEW YORK CITY.

By THOMAS DARLINGTON, Jr., M.D.,
NEW YORK.

Two conditions underlie and cause much of the illness found in New York City. These are: first, malaria; and, second, a fecal fermentation producing diarrhœa.

First, malaria. By that I mean disorders depending for their origin upon the micro-organisms of malaria found in the system. It is found all over New York City, though principally in the northern districts, the cases increasing in number the further north we go; and leaving New York and following up the valley to the Croton water-shed, we find malaria the most prevailing disease during the summer. Even the Croton water itself is malarious, but the water from the lake seems to be less malarious than that around the surrounding country.

Of the country east of the Hudson River and north of New York City, close to the river, the ground rises rapidly to an elevation of from one hundred to three hundred feet in height. Behind this is a valley somewhat narrow in proportion, and back of this still further the ground again rises to a height of about the same as that close to the river. In this valley and on the hills are found numerous cases of malarial fever, though there are fewer cases on the hills close to the river than in the valley and on the back range of hills; for here are numerous swampy places. These hills consist largely of granite, gneiss, and quartcite, with frequent depressions or cup-shaped places on the top which hold swamps, and these

swamps and cup-shaped places cannot well be drained on account of the hardness of the rocks.

Some of these depressions on the hills are quite large. One, on the site of the Jerome Park Race-track, with some adjoining land to the extent of one hundred acres, is to be taken as a new reservoir; while in another, just north of the city line, is an immense peat bog which is covered with a heavy growth of timber.

All types of the disease are met with. On several occasions I have recognized even that occurring every twenty-eight days. Throughout the main body of the city we do not get very pronounced cases as a rule, but more of a chronic type, and these cases do not yield readily to treatment; some will yield only to a complete change of climate. North of High Bridge or One-hundred-and-sixtieth Street the cases become more pronounced in character, and we find them principally of the intermittent type. Years ago the streets of the upper portion of the city were mapped out and monumented; and people built houses along the line of these proposed streets. Many of these streets have been recently or are now being opened, and the people who live in the houses along such openings, almost without exception, suffer from attacks of intermittent fever. The cases that occur from the opening of the new streets would apparently go to show that malaria is not only to be acquired from water, but also from lung absorption of the atmosphere, as most of them use the city water; but that is an inquiry apart from our present paper.

The water-supply of the city comes from three sources: from Croton Lake, Lake Kensico (what is termed the Bronx River supply), and Grassy Sprain, which also supplies the city of Yonkers. Of these supplies, the Croton water is the best, the other two are about alike. The Croton water-supply runs through two aqueducts, each of which is thirty miles long. All of these come from malarious regions. From 1885 to 1888, while this work was in progress of construction, I acted as surgeon to the laborers employed within the limits of

New York City. There were on my section of the work about three thousand men; the number of cases of malarial fever was enormous. A single instance will suffice to give you an idea of the prevalence of this disease. On one occasion there were not sufficient workmen to keep the works going, and with the timekeeper I inspected the boarding-houses and found in a single day three hundred and fifty-two cases of intermittent and remittent fevers. On account of the large number of these cases quinine was left in the charge of the timekeeper with instructions how to use it, and during the month of August, 1887, Shaft 20, alone, used more than three pounds.

As in other malarious places, not only do we find malaria as a disease by itself, but very frequently as a complication of many other diseases; and not only that, but by lowering the tone of the system it assists in liability to other diseases, so many cases of illness in New York will not yield to treatment until we first get rid of malaria.

It is very frequently found here as a cause or complication of other diseases. We find it most frequently producing or assisting in the production of neuralgias. Dysentery is common, and it acts not only as a complication, but cases are seen in which the tenesmus, pain, etc., occur only every other day at the same hour. I have seen it even in a case of meningitis; there was an exacerbation of symptoms, such as delirium, fever, etc., every other day; this patient promptly succumbed to the administration of quinine given as the result of a consultation.

I find also in my practice numerous cases of cough, which yield only to the administration of quinine. One of these cases which recently fell in my hands had been treated through the greater portion of the winter by various physicians in the city, but without benefit. On administration of sixty grains of quinine in divided doses the incessant cough ceased as if by magic.

But what is most interesting to the members of this Society is the association of malaria with cases of phthisis.

Case I.—A young woman, aged nineteen years, native of New York, who had been under my care for over one year with phthisis, and had so improved under treatment that I considered the process dormant, returned from the seashore to New York in the latter part of August. At the end of one week she was seized with intermittent fever and was having the third attack when I was called in. Prompt treatment with quinine broke up the attack; and this was followed with arsenic, combined with the syrup of iodide of iron, but the patient lost in this illness all the ground gained in one year, and from that attack she never rallied and has now passed into the third stage of phthisis, and it is merely a question of time.

Case II.—A civil engineer, aged thirty-two years, native of New York, acquired phthisis, but managed to do very well for over three years, when he also acquired intermittent fever. After this was broken up he spent some time in Sullivan County, New York, and improved greatly, but he returned too soon to the city and again acquired malaria, and he too from his latter attack never properly rallied, and died in the spring.

From these cases alone we learn a certain lesson. Many phthisical patients are sent from New York for the winter because of the severity of the weather, but are permitted to return to the city to see their friends on the return of spring. We must always keep in mind the liability of such patients to acquire complicating diseases.

So we find malaria in New York not only causing but complicating a large number of diseases.

The second condition, that of a fecal fermentation producing diarrhœas, is much more common than the first. This subject was recently written upon by Dr. Francis Delafield—the first in public to make known the condition—but I had already partly written my paper before his appeared; I feel it is proper to also read on the same subject. Its principal feature is characterized by a looseness of the bowels, generally occurring every morning; from this symptom it has received

the name of morning diarrhœa. This diarrhœa varies from a single semi-solid movement with a slight discharge of mucous to a watery diarrhœa with a number of movements. It may affect any class in any portion of the city. Those who come from other cities to make New York their residence are not usually affected immediately, but only after some little time of residence. Usually the movements have considerable odor, but this is not always recognized on account of water-closets. They may also vary in color from a lack of bile or as the result of fermentation. Generally they show their fermented state from the admixture of gases.

Many patients not only have these movements in the morning, but also at other times in the day, frequently after eating. Often they are preceded by colicky pains, and when these come on the patients must immediately find a closet. Some patients after the movements experience great relief, while others have a feeling of exhaustion. Oftentimes also the pain is located at one point, usually over the appendix, so that many of these patients imagine they have appendicitis. Some patients lose flesh while others do not, but remain quite stout and would apparently appear to be very well.

In some this condition continues steadily for years, in others it is intermittent, a part of the time being troubled with the condition, then well for a season and again a return of the trouble.

But it is not the diarrhœa that is of most importance, but the various disturbances of the system due to an absorption of fecal material from the colon.

This condition affects different people differently; though there is one disturbance that we find in nearly all cases, and that is extreme mental and nervous irritability. Matters of small import worry them; they do not get along well with their families, the children annoy them, they have a constant fear of impending danger, in travelling they fear collisions, if they get up on a high place they become nauseated, feel like jumping off, and when they are well (free from diarrhœa) they have none of these symptoms. It matters not whether

the patients be thin or stout, they all suffer more or less from this condition. Others still suffer from neuralgias. A very considerable number complain of pain from the gall-bladder to the scrotum, and on account of the general pain in that region they believe they have appendicitis. Oftentimes the neuralgia is located in the shoulder or the side of the neck, and that only occurs when they are affected with this looseness of the bowels. Still others suffer from a chronic tonsillitis; this tonsillitis is not painful in character, but is quite continuous, and shows itself by a slight enlargement of the tonsils and a constant whitish exudation, which has the appearance somewhat of a diphtheritic membrane. Still others suffer from coryza. In some this coryza occurs every morning until the patient has had a movement, and then within a short time after it disappears. Others only have this symptom when for any reason the customary morning movement has been delayed.

The treatment is, of course, symptomatic, and to disinfect the intestinal tract.

The customary treatment in New York is to use the subgallate of bismuth, or beta-naphthol, or salol, or bismuth and opium; this latter gives some temporary relief. But so far as the rest of the remedies are concerned they have been an utter failure in my hands. Besides these remedies the patients are generally put on an exclusive diet of milk or of meat and hot water. The remedies that I have found of most service are the bichloride of mercury combined with dilute hydrochloric acid, or castor oil by itself or combined with creosote, or a mixture of castor oil with syrup of rhubarb and salicylic acid, but the only certain remedy is a change of climate; this acts like magic. Patients leave New York one day and find a marked improvement the day following. Recovery is certain so long as they stay away, but unfortunately the trouble usually returns upon a return to the city.

DISCUSSION.

Dr. Daland: I was much interested in Dr. Darlington's paper. I did not know that New York presented so much malaria. I would like to ask if these workmen got the malaria from the earth or from the water in that locality.

The remarks he made in reference to phthisis complicated by malaria are to me very interesting. One can see how important it is to make blood examinations and eliminate that danger by treatment.

I would like to ask in reference to his own idea of the causation of the fecal fermentation. It would seem that those cases should be greatly benefited by the use of the long rectal tube and the flushing out of the colon by Oss to Oiij of water.

Dr. J. C. Mulhall: Do I gather, then, that the water-supply of New York City is exceedingly bad?

Dr. Babcock: I would like to ask if Dr. Darlington has tried salicylate of strontium in those cases.

Dr. Curtin: I have seen a great number of cases of diarrhœa associated with mucous discharges, especially the last two years. They have this discharge with the stool and without. It seems to be an exudation from the colon. At times it looks like the membrane of diphtheritic enteritis; again it may be clear, transparent mucous. I have seen twenty or thirty of these cases within the last two or three years; I have made a collection of their discharges, and hope some day to examine them carefully and trace them to their origin.

Dr. Walker: I can fully indorse the remarks made by Dr. Darlington in regard to the malarious condition of the northern part of New York. I have always considered Harlem River a malarious district. I have had a large number of patients come from there to Philadelphia for treatment. I could not do anything until I first poured in quinine with a liberal hand. After controlling this malarious condition of the patient, the rest of the treatment was readily accomplished.

In regard to malarial cases and phthisis, I have had a number of incipient cases of phthisis associated with malaria.

In regard to the bowel trouble, I concur entirely with Dr. Curtin. Some of these cases are rebellious to treatment. I had one case in which I douched the colon and used nitrate of silver, and that one application of the nitrate of silver was followed by complete cure.

Dr. Darlington: In regard to malaria. I took a contract from the contractors of the new Croton aqueduct to look after the men, and saw many thousand cases. They drank the water that dripped

from the hard solid rocks that make a part of the tunnel. Then again they would strike underground springs; others would drink the water in the shaft. In the surrounding country they drank out of the wells. Most of them lived in shanties; the accommodations were poor; they had broken rest; worked hard; and were a drinking crowd. These were the conditions. Some of the men who had worked at Panama said it was far healthier there.

A large number of people in New York City use distilled water, or some imported water. It is the upper part of the city of New York, where there are "dead ends" to the pipes, where the greater number of cases of malaria comes from.

THE INFLUENCE OF ALTITUDE UPON THE SEXUAL ORGANS OF WOMEN.[1]

By W. A. JAYNE, M.D.,
DENVER, COLORADO.

VERY early in my medical experience in Colorado I became aware of many popular beliefs concerning the effects of high altitude climate in health and disease, and as modifying the action of drugs. For instance, it was stated that the climate of Colorado, and particularly of the more elevated regions, was detrimental, if not positively dangerous, to persons suffering from heart disease in any form; that nervous disorders were far more common and less amenable to treatment here than elsewhere, and in some forms, as chorea, a cure could not be expected without a change to a lower level; that contagious diseases were less severe in type and communicated less readily; pneumonia peculiarly fatal; and, above all, the climate was declared to be especially "hard on women." Subsequent observation led to the conclusion that there was good ground for some of these popular opinions, but very generally the facts were exaggerated through a failure to appreciate the strong influence of conditions of life other than climate, while occasionally these statements were fallacious.

Regarding women, the statement seemed to be borne out in fact, and it was soon apparent they complained of the climate much more than men. Various trains of symptoms, all more or less closely related to the nervous system, were mentioned. Many would give a distinct history of the onset of these

[1] Read by title and not open to discussion.

troubles directly after arrival at a high altitude, others only after a considerable residence. In either case a visit to a decidedly lower level would be promptly followed by relief, the symptoms returning in many instances shortly after renewing their residence. Some would become thoroughly acclimated, while others, particularly those of a nervous temperament, would continue to assert they never felt quite well.

Among women, in the absence of organic disease, the more common complaint would be of a nervous, very possibly reflex character, such as a general "nervousness," a feeling of general undefined discomfort, an unwonted irritability of temper, sleeplessness, perhaps only a decided sense of not being quite well, without being able to exactly describe in what respect. The trouble would often be more tangible, as palpitation and irregular action of the heart, headache, fulness of the head, neuralgia, gastric disturbance, and, in time, in those of neurotic temperament, moderate loss of flesh and color. Occasionally such illness was so severe or so persistent that a change of residence became compulsory. In very many of these cases there were associated disorders of menstruation. In various ways and in connection with ordinary diseases, especially during convalescence from them, women would complain of an aggravation of many symptoms, which would promptly pass away, allowing of a more rapid and smooth recovery on resorting to a lower climate.

The frequency of such instances was noticeable, and during an active practice of nine years at an altitude of from 7500 to 10,000 feet, and two years in Denver at 5000 feet, many opportunities have occurred for observing them over an extended period.

In looking over the literature at my command, I have found little or no reference to the effect of high altitudes upon the sexual organs of women; and having seen many cases in which their derangement appeared to be due to the effect of climate *per se*, I venture to present my impressions, incomplete though they may be, hoping to elicit the experience of others similarly located.

The most prominent features of Colorado climate are dryness, low barometrical pressure, large amount of sunshine, heightened electrical conditions, and, I believe, in a general way, a greater degree of healthfulness.

Whatever influence these climatic conditions exert upon the sexual organs of women must be through the nervous system, and for their effect upon this part of the economy reference may be had to the excellent papers of Eskridge in the *Journal of Nervous and Mental Diseases* for October, 1887, and in the TRANSACTIONS of this Society for 1890 and 1891. Eskridge considers the bright sunshine and dry atmosphere with wind as the climatic elements irritating to the nervous system. As the result of his observations he asserts that inherent nervous temperaments are made worse by a prolonged residence in Colorado, and that there is more so-called nervousness here than on a lower level. Dr. McDonald, of Pueblo, is quoted as saying that women suffer in this regard more than men, and that irritable nervous systems are not favorably affected by this climate. It is also stated that Reed, of Colorado Springs, believes that women recover less well from their second and third confinements than from their first, and that hysteria is more common here than elsewhere. Other observers do not agree with this latter statement, and Eskridge himself says that well-developed cases of hysteria are more rare, and my own experience bears him out.

I have never had reason to suppose that organic diseases of the sexual organs of women were influenced by the climate, except in so far as they were affected by nervo-vascular disturbances, and then to slight extent, if any. I am rather firmly of the opinion, however, that the climate of Colorado, especially in the mountainous districts, has a most decided influence in determining functional uterine derangements in certain classes of women, and that they react more strongly upon the general system than at sea-level. Certain it is that in a large proportion of women in Colorado there exists what might be termed a higher degree of nervous tension, especially in times of unusually low barometrical pressure, and in many

this condition extends to the sexual organs, determining a state bordering upon hyperæmia with increased sensitiveness, if not at times almost hyperæsthesia.

It is a very prevalent belief that in Colorado sexual activity is greater and the appetite increased. Not infrequently husbands in conversation have remarked upon change in this respect in their wives after coming to Colorado. Other physicians have given expression to this opinion, and it has seemed that with more than ordinary frequency I have been consulted because of such increased sexual appetite as to amount to nymphomania, and for erotic tendencies.

It would appear that the most noticeable effect of the climate of this high altitude upon the sexual organs of women is in the disturbance of the menstrual flow, seldom of an aggravated character. Menstrual disarrangements are, I believe, more common in Colorado than at the sea-level, and in my experience they are more marked in two classes of women: the one, the spare neurotic type, with anæmic tendency; the other, the full-blooded, with indications of plethora. Disturbances are not infrequently induced in others, not of these types, possibly attributable to climate, but I cannot now classify these and speak of them with any definiteness. Those of the neurotic type are very apt to show decided irregularity when unacclimated, the period being delayed or coming on too soon without any apparent rule, the flow in either case being too profuse. After a prolonged residence such women finally become regular, but with greater loss than was normally the habit. These women complain bitterly at times of the climate, get run down, anæmic, and are only relieved by returning to sea-level, or possibly by rather frequent and prolonged visits to a lower altitude. The full-blooded woman with high color, and, perhaps, a tendency to embonpoint, as far as my experience extends, if any change is noticeable, is more apt to develop scantiness of flow without such marked irregularity. This continues for a rather considerable period after coming to the State, and not infrequently becomes a permanent habit.

Headaches are very common in this class of women. Postponement of menstruation, perhaps cessation for a month or more, is not uncommon, particularly in women of a nervous temperament, going direct from sea-level to the mountainous parts of Colorado.

So common is the complaint of general nervousness, the accompaniment, if not the result, of menstrual disorders, that it is a prevalent belief that women should, so far as possible, make not infrequent visits to lower levels, if they would retain their health and avoid these annoying troubles.

Dysmenorrhœa of the neuralgic and ovarian types is quite common at high altitudes, and occurs with unusual frequency, not only in young girls, but in multiparous women free from either uterine or ovarian disorders to explain it. Very many say that they are entirely free from all such pain and distress at a lower level. Several of my patients, who in the mountains had rather troublesome dysmenorrhœa, tell me they are quite free from it, and the menstrual function in other respects is more normal since living in Denver, and without any treatment.

Girls brought up in Colorado very frequently show a tendency to menorrhagia, the menstruation anticipating the proper periods during the first few years after reaching puberty. Women with lesions of the mitral valve almost invariably complain of increased menstrual flow. I do not believe that uterine hemorrhages from disease or following confinement are either more profuse or more common.

I am not prepared to offer a theory in explanation of these apparent changes in the sexual life of women in this altitude; I may say, however, that I have always considered them to be the expression of nervo-vascular conditions resulting from a state of high nervous irritability and tension, influenced perhaps by a greater fulness of the venous system.

THE GEOGRAPHICAL DISTRIBUTION OF THE MINERAL SPRINGS OF THE UNITED STATES.

By A. C. PEALE, M.D.,
WASHINGTON, D. C.

"Water cures gout and hypochondriac melancholy; it benefits gravel and stone in the bladder; it makes the child grow strong in the womb, and increases the mother's milk; it stays hunger; for there was a certain crack-brained man who, at Leyden, when Dr. Carr resided in that university, pretended he could fast as long as Christ did, and it was found that he held out the term of forty days without eating any food, only he drank water and smoked tobacco. Water is also of great use to strengthen weak children; it prevents swelling from bruises, sickness of the stomach, shortness of breath, and vomiting; it cures fluxes, consumption, flushes, colic, smallpox," etc.

This, gentlemen, is not a quotation from one of our modern mineral spring circulars, but an extract from a work nearly two hundred years old, entitled *The Curiosities of Common Water, or the Advantages thereof in Curing Cholera, Intemperance, and other Maladies*, by John Smith, C.M. It was reprinted at Boston, Massachusetts, from the London edition of 1712, for Joseph Edwards, at the corner shop on the north side of Town House, in 1725.

Had a map of our mineral springs been prepared when this was written, or when it was republished at Boston, the High Rock Spring at Saratoga, some of the springs at Ballston, New York, the Warm Springs of Virginia, the Sweet Springs

of the same State, the Greenbrier White Sulphur Springs, and Berkeley Springs, then called Bath, might have been shown upon it, although none of them was at all improved or used as a resort until the time of the Revolution or later. Had the map been made in 1831, after Dr. John Bell published his *Baths and Mineral Waters,* the springs named above would not be so few in number, for some fifteen other springs would probably have been added to the number, nearly all of these would have been in the Appalachian region, mainly in Virginia, New York, and Pennsylvania, with a few in North Carolina, Kentucky, and one in Arkansas, the celebrated Hot Springs, then known as Washitaw Springs. If we have not made any striking advance in the claims of our mineral-water literature, as shown in most of the mineral springs circulars of to-day, we have certainly advanced in the knowledge of the location of our mineral springs. I have recently compiled for the United States Geological Survey two maps, one showing the distribution of some 330 springs whose waters are put upon the market to the amount of more than twenty million gallons annually, with a valuation between four and five millions of dollars. Upon the other map I have plotted nearly seven hundred mineral springs which have become resorts.

The map of those springs whose waters are used commercially shows, at the first glance, that the majority of such springs are found in the eastern United States and in the Mississippi Valley. West of the one hundred and first meridian they are largely confined to the Pacific Coast. In Idaho, Colorado, New Mexico, and Montana we find, altogether, barely a dozen springs so used. This is not because the total number of springs in the East is so much greater than in the West, but is mainly because the former is the seat of the greatest population, and, consequently it is more thoroughly developed as to the utilization of its resources in the matter of mineral waters, as in many other respects.

The map of the "Mineral Springs Resorts" presents a much larger total number of springs, and shows also a more

equitable distribution over the country, for many of our most improved and best-known resorts are found in the middle West and in the Rocky Mountain region, and in no respect do they suffer in comparison with those in the East, or with those on the Pacific Coast. Thus a map giving all the springs would have some plotted within the borders of every State.

Another glance at the map will show that our thermal springs lie mainly in the West. The States west of the one hundred and first meridian include a little more than 39 per cent. of the total area of the country, and yet they contain more than 80 per cent. of its known thermal springs.

The thermal quality of a spring depends largely upon its geologic position. Professor W. B. Rogers many years ago pointed out the connection between the warm springs of Virginia and the faults and anticlinal axes of the Appalachian Mountains. In almost every country a connection between thermal springs and mountain ranges is readily recognized, and just as apparent is the connection the world over between hot or warm springs and the occurrence of volcanic rocks. In the Rocky Mountain region and other parts of the far West, in addition to the mountainous character of the country, which is of recent origin compared with the Appalachians, we have also a region of more recent volcanic disturbance, and one in which rocks of igneous or eruptive origin frequently cover extensive areas. As already stated, the hot and warm springs of Virginia and the warm springs of North Carolina and Georgia are found within the limits of the Appalachian folds, and the Arkansas hot springs are found in connection with the Ozark Mountain uplift.

Inasmuch as mineral waters derive their solid constituents from the rocks through which they pass on their way down and up before they emerge as springs, in this respect also they must be very dependent upon the geological structure of the country. With this in mind, a comparison of the geological map of the United States with a map of its mineral springs is very instructive. In regions where the older or metamorphic rocks constitute the surface formation, or are

near to it, as a rule, the waters contain a much smaller percentage of mineral matter than in those regions where, in order to reach the surface, the water must pass through sedimentary rocks, which, on account of their structure, are more readily affected by the solvent powers of the water.

It has frequently been stated that thermal waters are less highly mineralized than non-thermal waters. *A priori*, hot water is a better solvent than cold water, therefore, if sometimes a thermal water is less highly mineralized, it is probably because it comes from a greater depth, where the rocks are of such a character as to be less readily acted upon. Other things being equal, there is no reason why a thermal water should not contain the same ingredients as a non-thermal water, and, as a matter of fact, where the two occur in the same locality, coming through the same rocks, the difference in quantity is in favor of the thermal water. Here in Virginia, for instance, at the Hot Springs, one of the springs, with a temperature of 78° F., has 18.09 grains per gallon of solid contents, while another, with a temperature of 110° F., has 33.36 grains per gallon ; and at the California geysers the coldest spring, with a temperature of 70° F., has 7.12 grains per gallon, and the hottest, at 212° F., contains 296.4 grains per gallon.

So far as the general geological features of the North Atlantic States, including those from Maine to Pennsylvania, are concerned, they might be divided into the sections so long recognized in our older school geographies, viz., the New England and the Middle States. In the former the older rocks form a large part of the surface, which accounts for the fact that, as a rule, the mineral springs of that section are somewhat less highly mineralized than are those of the Middle States. The springs of Maine are slightly alkaline-saline and chalybeate. In Vermont the conditions are much the same, except that sulphuretted springs are more numerous. Connecticut, Rhode Island, and Massachusetts are not remarkable for their mineral springs, though chalybeate springs are common in all. Many of the mineral springs of the New Eng-

land States are utilized commercially for medicinal purposes and table waters, and also as places of resort.

In the Middle States a much larger number of springs is found and a larger proportion of the waters is utilized, both commercially and as places of resort. Saratoga is the prototype of all other mineral spring resorts throughout the entire Union. In the Oak Orchard Spring, New York has also one of the most celebrated acid springs of the country, while Richfield Springs, Avon Springs, and the Deep Rock Spring are well known far beyond the State limits. In Pennsylvania Bedford Springs is one of the oldest resorts, while Cresson Springs, Gettysburg Katalysine Spring, and many others are well known. In New York and Pennsylvania, as well as in New Jersey, chalybeate springs outnumber all others. In New Jersey the best-known resort is the Schooley Mountain Spring, a chalybeate spring that has been utilized for many years.

In their geologic features the South Atlantic States are not unlike the Middle States, and naturally the springs also are of the same general character. Thermal springs are; however, more numerous, being found not only in Virginia and West Virginia, but also in North Carolina and Georgia as well as in Florida, where all the springs are slightly thermal and nearly all are sulphuretted. The flow from some of the Florida springs is sufficient in volume to float steamboats of considerable size. Maryland has a fair number of resorts and several well-known waters which are used for commercial purposes. Virginia is, *par excellence*, the mineral-spring State of the section, occupying among the South Atlantic States the same position that New York does in the North Atlantic section; indeed, it is second only to that State in the number of springs that are utilized commercially, and exceeds it in the number of its resorts. The Hot Springs of Virginia are among the most celebrated in the country. West Virginia is equally noted for its springs, having two of the oldest resorts in the United States in Berkeley Springs, at Bath, and the Greenbrier White Sulphur Springs. The general character of the

springs in Virginia and West Virginia is the same, saline sulphuretted waters being most numerous, although alkaline, chalybeate, and acid springs are found, both hot and cold. The springs of North Carolina, South Carolina, and Georgia are much like those of the Virginias, and each State has resorts of national as well as local reputation.

The South Central States include Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Texas, Indian Territory, Arkansas, and Oklahoma. In this section of the country the saline springs outnumber all others, while thermal springs are relatively few. Though a large part of the area is occupied by comparatively recent geological formations, yet in the northern and western portions carboniferous rocks, with the underlying formations, are well developed, and they are usually prolific of mineral waters. Tennessee, Kentucky, Arkansas, and Texas are the important mineral-spring States of the section. The Hot Springs of Arkansas occupy a first place among the thermal waters, not only of that State but of the entire country. The springs of Kentucky and Tennessee have had considerable attention paid to them by geologists and chemists, and they have many improved resorts. The Blue Lick Springs are well known. Texas is noted for its springs, among which are a number of acid springs containing free sulphuric acid, and many hot springs in the western part of the State. In Alabama, Mississippi, Louisiana, and Indian Territory there are numerous mineral springs, but apparently they have had little attention paid to them, and we find that fewer have been improved there than in the other States of the section.

The north central section includes the States from Ohio westward to Missouri and Nebraska, and northward from the Ohio River to the Canadian line. Here the geologic conditions are similar to those of the South Central States, and in both sections saline chalybeate and calcic waters are abundant, many of them being highly sulphuretted. In Ohio calcic springs probably predominate. The springs of Indiana and Illinois are much the same as those of Ohio. Missouri

is a State rich in mineral springs; the Sweet Springs of Saline County being perhaps the best known. The mineral waters of Kansas are drawn mainly from artesian borings, as are those of Michigan also. In both States the waters are well mineralized, sulphuretted saline springs predominating. In the northern part of the north central section, where there are large areas containing metamorphic surface rocks, the springs are like those of the New England States in their general character, not being, as a rule, very highly mineralized. The Waukesha Springs have a wide reputation, and Wisconsin stands at the head of the list in the number of gallons of water sold from her springs. The springs of Minnesota and Iowa are much like those of Wisconsin, calcic-alkaline and chalybeate springs being most prominent. The occurrence of acid springs in Iowa is interesting. Dakota has the one thermal spring of the section in the "Dakota Hot Springs" of South Dakota.

The Western States include the Rocky Mountain region and the Pacific Coast with the intervening Great Basin and Plateau Region. As already stated, thermal springs are most numerous in this section. California stands at the head, so far as the improvement of the springs is concerned, both in respect to the number used as resorts and of those whose waters are used commercially. Its mineral waters are of all kinds, and they are not confined to any one section, but are found from one end of the State to the other. With the exception of Wyoming, which includes the Yellowstone National Park, California contains a greater number of mineral springs than any other State.

The Yellowstone Park is, of course, the greatest resort in the United States, and it is deservedly so, not only on account of the presence of its geysers, but also because of the great variety in its springs; when they are better known they will undoubtedly be more highly prized for their medicinal virtues than they are now.

Although there are nearly 4000 springs and 100 geysers in the National Park, less than 100 of the springs have had

a careful analysis made of their waters. The springs are, of course, nearly all thermal, and may be classed under three heads, viz.: (1) calcareous waters which are generally carbonated to a slight degree, and sometimes are sulphuretted; (2) silicious waters, that are acid, carrying free acid in solution; and (3) alkaline waters, also silicious. Nearly all the springs carry arsenic, varying in quality from 0.02 to 0.25 per cent. of the mineral matter in solution. The waters of one locality in the Park are compared by Mr. Arnold Hague to those of the famous Sanitarium of "La Bourboule" in France, which has achieved a wide reputation for the efficacy of its waters in nervous diseases.

Colorado, sometimes called the Switzerland of America, has had considerable attention devoted to its springs, and there are now many well-known resorts within the limits of the State, of which perhaps Manitou, near Colorado Springs, is most widely known. A number of the waters are used commercially. Both hot and cold springs are found; many are alkaline, others are chalybeate, and saline springs are numerous. They are sulphuretted and carbonated in many cases.

In Arizona and New Mexico alkaline and saline waters, a large number of them carbonated and sulphuretted, are so numerous that they attract but little attention. They are even more common in some places than springs of pure water. Several springs in New Mexico are utilized for commercial purposes, and Las Vegas Springs is one of the finest mineral spring resorts in the country. Utah and Idaho both have many well-developed springs. In the former the hot springs at Ogden and at Salt Lake City may be mentioned, and in Idaho Hailey's Hot Springs and the Soda Springs of Bear River are perhaps best known. From the latter comes the Idanha Natural Mineral Water, which is largely sold in the middle West.

Most of Montana's springs are thermal, and they are alkaline, saline, chalybeate, and calcic. Many of them are sulphuretted or carbonated. Among the latter is one closely resembling the celebrated Apollinaris water of Rhenish Prus-

sia. Another spring resembles the Sprudel Spring of Carlsbad. Many of the springs have been improved and are used, to a considerable extent, as resorts. The White Sulphur Springs, Hunter's Hot Springs, and Ferris's Hot Springs are well known locally, while the Broadwater Hot Springs near Helena are scarcely excelled anywhere, especially the matter of improvements. The plunge bath there, connected with one of the hotels, is one of the largest in the world.

Among the Pacific Coast States, Oregon comes next to California in the number of its mineral spring resorts, and there are a number of springs both in Oregon and Washington where the waters are bottled and offered for sale. The State of Washington has the celebrated "Medical Lake," in Spokane County, the waters of which are condensed and the evaporated salts put up in packages and extensively sold. Lastly, Alaska, whose springs have never been mapped, is a hot spring territory that has few equals. So far as is known, these springs are generally saline and sulphuretted.

The practical point in this *résumé* of our mineral springs is, that, within our own borders, we have springs that duplicate those of Europe, or, indeed, of any other part of the world, and we have them at all elevations, from that of the Atlantic or the Pacific Coast to the high mountain areas of Colorado, the apex of our country where the mountain peaks were above the water as islands while the rest of the country was beneath the seas. We have springs also under all climatic conditions, from the equable climate of Southern California to the glacier-bound regions of Alaska, and from the sunny skies of Florida to the bracing air of New England.

DISCUSSION.

Dr. Solly: Our Association is fortunate in having so high an authority as Dr. Peale report upon this subject. I have myself given some attention to the mineral waters throughout the United States, especially to those in my own neighborhood, where we have in the

Manitou Soda Spring a water that closely resembles and I believe excels the Apollinaris in its use for the table, or for dyspepsia in certain forms. The fact that the latter is found everywhere, while the former is rarely seen, is one illustration of many that could be given of the fashion of running after imported to the neglect of domestic articles of equal or superior quality. The waters of Jordan, as in the days of the prophets, glide neglected by, while those of Abana and Pharpar are eagerly drunk. There are throughout the United States as good and as varied waters as in Europe, and now that such well-equipped bath-houses as we see at these Hot Springs are being provided, there will be no excuse for the American, except it is the sometime advantage of foreign travel, failing to patronize home watering-places. In classifying and describing accurately the various spas, much winnowing of the wheat from the chaff must, however, be done.

Dr. Peale: A point of practical interest is that we have within our own borders springs that duplicate almost any spring in Europe. We find them at all elevations: on the Atlantic Coast from New England to Florida, reaching back to the Mississippi Valley; in the high areas of Colorado, and other parts of the Rocky Mountain region; from the equable climate of San Diego in Southern California to the glaciers of Alaska, where we have them in connection with recent volcanic rocks.

The temperature of a spring depends largely upon the depth from which the water comes. There is a normal downward increase in temperature. It is true, to a certain extent, that there is a normal downward increase in temperature, but the heat depends, in part at least, also upon the character of the rock through which the water comes. Take the Comstock mine, for instance, in which the waters that come into the shaft, at the depth of 2000 feet, are so hot the workmen are obliged to work in very short shifts. The temperature is from 130° to 157° F. A deep well has recently been bored in West Virginia, where the temperature at the bottom is about 110° F. This well is 2500 feet deeper than the Comstock mine; but the Comstock mines are in volcanic rocks that hold the heat for ages, while in the West Virginia region the rocks are cooler shales. If a spring comes through an active volcanic region, of course it makes a great difference, and we may have boiling springs and geysers. If there are two springs side by side, and one is cold and the other hot, the former is probably a surface spring, whose waters have not penetrated very deeply into the earth, while the hot spring comes either from a much greater depth or has its origin in igneous rocks.

The analysis of the Healing Springs shows—if I remember rightly—that the water is magnesic sulphated or calcic magnesic sulphated; that is, they would be cathartic waters.

I want to say that I entirely agree with Dr. Solly in regard to Manitou. In Montana we have, also, a spring which is identical with the celebrated Apollinaris Spring of Prussia in analysis and in the taste of the water. We have also a number of springs much like the Sprudel; one especially in California that in every respect, except its slightly lower temperature, resembles the Carlsbad Sprudel water.

IS COCAINE AN ENSLAVING DRUG?[1]

BY F. H. BOSWORTH, M.D.,
NEW YORK.

WHEN Carl Koller in 1884 reported his discovery of the local anæsthetic properties of the solution of cocaine he added to our *Pharmacopœia* a drug which is absolutely unique, in that it possessed the double property of producing local anæsthesia and also of contracting in a marked manner the calibre of the bloodvessels circulating in the mucous membrane to which it has been applied. Its value, therefore, became inestimable, in that heretofore we possessed absolutely no drug which could accomplish either one of these effects. In addition to this, in absorbing the drug it possessed marvellous stimulating and mildly intoxicating effects. So valuable a remedial agent placed in our hands was necessarily received with the greatest enthusiasm, and our journals were crowded with reports of its successful use. Very soon, however, we commenced to hear of its dangers. A woman in one of our Western States dropped dead on applying a drop of 2 per cent. solution to her gum for toothache. A dentist in Elmira had been driven crazy by using a little in the air passages. A number of cases were reported where the use of small portions, locally, had produced most dangerous symptoms. Every case of syncope which followed a surgical operation in which cocaine was used was attributed to the dangerous action of the drug. The newspapers took up the cry and heralded it in large head-lines, "Dreadful Poison," "Deadlier than Arsenic," etc. It is a noticeable fact that after a year or so of its use

[1] Read by title and not open to discussion.

we ceased to hear any more of this danger, but we commenced to have reports of a still further danger—that of cocaine addiction.

We commenced to hear of patients who had fallen victims to the cocaine habit. Now I do not propose to enter very largely into the question to-day. I only venture to ask the question, Is there a cocaine habit, and, if there is, how dangerous a habit is it and how great a slavery? I have never been a believer in the great danger of cocaine, and I have used in the last eleven years a very large quantity of it. I I have used it indiscriminately and on a very large number of cases. In an experience of some thousands of cases I recall perhaps half a dozen in which the use of cocaine has produced symptoms of a rather unpleasant character, but never a single instance in which it produced symptoms which in the slighest degree alarmed me. A mild faintness, feeble heart-action, pallor of the skin, etc., lasting fifteen minutes to half an hour, and then passing away. I think the general profession has ceased to regard it as possessing any dangers in this direction, but I have been charged with prescribing cocaine to patients who have subsequently become addicted to its use. I believe that one friend has charged that my advice has filled the cells of the lunatic asylums with victims of this dreadful habit. I have made a pretty large and thorough investigation of the action of cocaine, by way of experiment on myself, and, without going very deeply into the question of its action, I will simply say that I have found it to possess marvellous stimulating properties; I have found it to produce delightful sensations of ease and comfort, which no other drug that I know of can do, but I desire to say here, with perfect frankness, that I have failed to see anything in the action of cocaine which produced that peculiar craving which is necessary to constitute the habit. There are certain things which are characteristic of enslaving drugs. One is universal, I believe, and that is that it creates a tolerance. Opium, hashish, and arsenic, as is well known, create such a tolerance that, as the habit increases on one, increased doses become

necessary to procure the desired effect. If there is one action more noticeable in cocaine than another it is that its use creates a susceptibility—the more one takes cocaine the less cocaine it requires to produce the desired effect. In my own case a sixtieth of a grain to-day would affect me as actively as a half-grain would have done ten years ago, although I ought to say that I have not experienced the effects of cocaine for eight years. This increased susceptibility to the action of cocaine has also been observed by Sollier[1] and Comby[2] and others. Another characteristic action of an enslaving drug is that its intoxicating effects are followed by a reaction. This is not characteristic of cocaine, although I should say that in my own experience, after experimenting with it for some months, I found that the stimulating effects which it first produced were followed by a sense of depression afterward, but only after I had experimented for quite a while. Another feature of an enslaving drug is that it creates a craving, an appetite which cannot be resisted. This, I think, is not a characteristic of cocaine. By one who uses it, it is found a pleasant and agreeable stimulant, yet that irresistable craving for the drug which is characteristic of opium and hashish is not established by the use of cocaine. A still further feature in regard to cocaine which I have observed, and in which I am fully corroborated by other observers, is that if one *does* acquire a liking for the drug the continued use of it will serve to overcome the appetite in certainly a very large majority of cases. In other words, as the susceptibility *increases* the pleasurable stimulation *decreases* in amount, and sooner or later the time comes when the use of the drug ceases to be a pleasure—I mean by this the use of the drug in large amount. The prolonged use of small quantities of cocaine may, perhaps, not produce this effect, and, on the other hand, I know of no serious effect which it produces. Among my own patients I know of a number of instances where it has been used in moderation through periods of five, eight, and even ten years,

[1] Société Med. des Hop. d. Paris, 1894, xi. 408.
[2] Société Med. des Hop. d. Paris, 1894, xi. 417.

without producing unpleasant effects and without creating a habit. Early in the history of the use of the drug in this country a number of observers reported that cocaine was an antidote to the morphine habit, and in this way many persons addicted to morphinism took up the use of cocaine with the hope for relief. In a few cases which I have had the opportunity of observing, my experience would suggest that the combination of opium and cocaine creates a far more dangerous habit than opium alone, and I am disposed to think that many so-called cases of cocaine habit are the result of a combination of the two drugs. Another combination which is also a disastrous one is the combination of opium and alcohol, although with this I have had less experience. The subject is one in which I have always taken a considerable interest, and I have followed somewhat closely the reports in our journals of cases of the cocaine habit. I do not hesitate to say that in all the so-called cases which have been reported, and many of them in full detail, I fail to find more than two cases, and possibly three, in which the report of the cases convinced me that the individuals were victims of the cocaine habit, and even in these cases the results were in no manner so direful as the reporter would seem to suggest. In what I have said I do not mean to suggest that there is no cocaine habit, for undoubtedly many people make use of it, but that it is an enslaving drug when used alone, in the sense that we use this term, I do not believe.

In Volume I.[1] of my recent work on the nose and throat there is recorded the case of nasal hydrorrhœa, which resisted all treatment. Within a few days I saw the patient, and he reports that for eight years he controlled the distressing symptoms of his disease by a cocaine spray, making use of from ten to thirty grains of the salt daily. His disease at the end of that time was cured. He assures me that after the eight years' use of it he stopped it absolutely, and with no effort. There was no suggestion of appetite. This is but one of a

[1] Page 261, Case IX.

number of such cases in which the long-continued use of the drug has been stopped without notable effect.

In other cases I have known patients who have fallen into the habit of using it, and finding its use pleasurable, continued to indulge in it. But in no instance have I found that this indulgence was followed by the dire affects which are characteristic of the enslaving drugs.

I do not assert that there are no dangers in the use of cocaine, but I do assert that I have not seen them ; and, furthermore, I believe them to be greatly overestimated. If this be true, it enables us to make freer use of a drug which possesses therapeutic properties of inestimable value. Debarred from its use by these supposed dangers which attend its use, we stand helpless to relieve some of the distressing diseases which we are called upon to treat, for our *Pharmacopœia* affords us no other drug which possesses its unique powers.

I should add, perhaps, that my experience is confined entirely to the local application of the drug to the mucous membranes of the air passages. Whether its use hypodermically is attended with any additional changes, I cannot say. Certainly its hypodermic use as a therapeutic measure is rarely indicated.

A CASE OF SIMPLE SEROUS RECURRENT PLEURAL EFFUSION: ITS FINAL OUTCOME.

By J. C. MULHALL, M.D.,
ST. LOUIS.

Mr. J. L. G. C. was sent to me March 1, 1893, by his physician. There existed on the left side the classical symptoms of a serous effusion, confirmed at once by the hypodermic needle. His history was that four months before he had been suddenly seized with pain in the side, fever, general prostration, dry cough, and dyspnœa, most probably, therefore, a simple pleurisy, *ab initio.*

The diagnosis, however, was pneumonia, and as after six weeks dulness and dyspnœa still existed, he was sent to California. Here dyspnœa increased, and without consulting a physician he returned, imbued with the idea that he preferred to die at home. When crossing the mountains, outward and homeward bound, he noticed great increase of dyspnœa. He was placed under my care.

He was a small, slender man, of sallow complexion, bad digestion, constipated habit, phosphatic urine, and arteries somewhat resistant. He was forty-four years, and, though not a drunkard, had used whiskey immoderately. Taking into consideration that the effusion had lasted four months, that he was beyond the elastic age, that his general health was bad, a most guarded prognosis was made as to the future usefulness of the left lung.

Sixty-two ounces of serous fluid were removed at the first tapping, with considerable relief to the dyspnœa, without com-

plete cardiac replacement. In three weeks there was reaccumulation of fluid, during which interim repeated examinations disclosed no vesicular murmur. During the next six months the pleural cavity was tapped eight times, the fluid gradually diminishing in quantity—the ninth tapping yielding only forty ounces. There was still no vesicular breathing to be heard. About this time he became impatient, and asked: "What is the final outcome of this to be? Am I to be indefinitely tapped? Cannot something radical be done to prevent the reaccumulation of the fluid?" These questions, from my own personal experience and from our somewhat limited literary resources at St. Louis, I could not answer, and they form the motive for my report in this case.

By means of cold-water surface friction to the skin, a rigid dietary, percussions over the liver, abdominal massage, flexure and extension of all the joints, daily open-air driving, the tongue had become clear, the bowels moved without drugs, the urine had become normal, the general health was greatly improved. There was rapid compensatory enlargement of the right lung. The patient could walk a mile, slowly, with but slight dyspnœa.

The propriety of performing Estlander's operation I discussed with several of our best men. Opinions were various. Like myself, not one had ever known multiple rib resection to have been performed in such a case. In view of his great improvement, and of the unknown danger of Estlander's operation in such a case, I compromised matters by sending him to Denver to be aspirated there, thinking that, though expansion of the left lung was hopeless, compensatory enlargement of the right lung would more rapidly develop at such an altitude. Dr. Lemen, at Denver, aspirated him twice in thirty days, when, for reasons foreign to his health, he returned to St. Louis. The ratio of improvement was not greater than at home. Within the next four months I aspirated three times. On the last occasion, but thirty ounces of the fluid could be with difficulty removed. The right side had greatly increased in all diameters, vesicular resonance being found four inches

below the nipple. He was able to attend to his ordinary duties, those of bookkeeper and assistant manager of a detective agency. The whistling respiration, audible ten feet away at our first interview, had quite disappeared. He was satisfied at once more being able to earn his salary. My intention was to tap the side every two months, in order to give occasional impetus to the expansion of the right lung. Thus, thirteen months from the first aspirations a practical cure may be said to have been effected. Two months later I was called to see him, and found him to be suffering from an acute attack of what I judged to be *la grippe* of the cerebral and abdominal type, with no involvement of the respiratory organs. I placed him under the care of another physician, who concurred in the diagnosis. He lingered two months and died. At the autopsy the cause of death was found to be tubercular peritonitis. The right lung was healthy, and very large in proportion to the anatomy of the rest of the body. The left was an airless stump, bound to the vertebral column. The pleura, parietal and diaphragmatic, had thrown out inflammatory material, which in coalescence with the pericardium had filled up the lower portion of the pleural cavity. This, assisted by the remains of the left lung and the encroachment of the right lung on the left side, left a cavity which contained twenty-five ounces of serum. Sections from the left lung showed but various phases of connective-tissue proliferation. It would seem, therefore, that in simple serous recurrent pleural effusion, even at middle age or beyond, repeated aseptic aspirations, with general hygienic measures, may effect a practical cure without expansion of the affected lung, and that a year or more may be consumed in this manner before multiple rib resection is practised.

Since writing the above, I have read in the London correspondence of the *New York Medical Record* of May 25, 1895, that at the Medical Society of London Dr. S. West related the case of a woman, aged fifty-one years, whose chest he aspirated thirty-seven times within a year. With misgivings, he consented to the chest being opened. An empyema developed,

and for a time her condition was critical, but ultimate recovery and expansion of the lung ensued. Dr. Hall said it was always undesirable to open the chest in simple serous effusion, and that he would tap seventy times seven, if need be, so long as the effusion was clear.

My case seems to teach that even when the lung will no longer expand, a practical cure may be effected without opening the chest.

DISCUSSION.

Dr. Babcock: This case is of interest to me, because last winter I had a patient, a woman of middle age, who had a serous effusion with apparent displacement of the heart to the left, a greatly dilated and feeble organ. Danger to life by cardiac failure seemed imminent.. She was aspirated, but the effusion returned with great rapidity. A week later she was tapped again, and the fluid returned with fully as great, if not greater, rapidity. Her suffering became marked; and we realized that the woman could not live, apparently through pressure of the effusion on the heart.

In consultation with the surgeon who had performed the aspiration, it was decided, in view of the rapid return of the effusion, to establish permanent drainage. Accordingly, the operation was done after the most approved method by resection of a rib; but the result was not good. Not only was serum discharged in large quantities, but we were astonished by the large flakes of fibrin that were also formed and had to be removed. The patient gradually failed and died, with all the evidence of cardiac failure and hypostatic congestion of the lungs.

One discovery of great interest at the autopsy was that the heart had not actually been displaced by the effuson, but was held to the left by old adhesions, antedating probably by years her last illness. The pericardium was completely adherent, and there were several large calcareous plates on the anterior surface of the myocardium of both ventricles, one of them being as large as a silver half-dollar. There were fresh fibrous adhesions in the right pleural cavity, showing that an acute pleuritis had been set up after the operation.

The failure of the heart had been due to the adherent pericardium, and not to the presence of fluid in the right pleural cavity, which fluid, in the absence of old neuritic adhesion, had probably been a unilateral hydrothorax. On this hypothesis one can understand the failure of the two aspirations to give relief. The patient would have

died had the last operation not been performed. I believe it hastened her end. In consequence of this experience I should hesitate again to recommend the establishment of permanent drainage in a case of intrapleural effusion.

Dr. C. E. Quimby: In cases of pleurisy which I meet now, it is my custom, instead of attempting to develop the healthy lung, to hold that lung down. I strap the chest so as to maintain the same amount of dyspnœa, keeping it down to that point where it is difficult for the patients to breathe, and so forcing them to stretch the affected lung rather than allow them to get all the development by the enlargement of the other lung, We accomplish very little by the development of the healthy lung; we increase residual, rather than tidal air; we do not increase the capillary circulation upon which inspiratory capacity finally depends. Of course, in treating these cases I have stretched the affected lung open by pneumatic means; the compression, or strapping down of the healthy lung, assists very materially, as it permits of the application of greater force without injury to the healthy lung.

Dr. Babcock: Can you accomplish this in long-standing cases, where there are old adhesions? Is it not only in recent cases, before the affected lung has lost its elasticity and been bound down irrecoverably?

Dr. Quimby: In the case which Dr. Mulhall describes, the lung was not bound down; it was separated by the effusion.

When the lung is tied tight to the chest it is, no doubt, in some instances practically impossible to develop it very much; I have rarely seen a case, however, that I could not enlarge from one-half an inch to an inch or more, and develop a moderate amount of motion.

I confess to having great faith in the general principle of pathology that intermittent moderate stretching of fibrous tissue produces absorption. I pull upon these adhesions once in two or three days, and while, of course, there are a great many of them that cannot be entirely absorbed, I am convinced absolutely that it is possible to give a goodly amount of relief in such cases. Where the lung has become firmly adherent, you must keep it up a long time. I have one patient who has been treated once a week, sometimes twice, for between two and three years. That is, of course, not in one sense a cure; but he is able to stay in New York and attend to his business instead of living in the mountains. It is a clinical relief, if not a scientific cure.

Dr. Solly: What Dr. Quimby has said concerning the effects of the pneumatic cabinet interests me very much. They, in a measure, resemble those of high altitude, where chest expansion is also increased, but in a natural, gentle, and continuous manner, in this differing from the rapid and intermittent action of the cabinet.

Dr. Judson Daland: I was much interested to note that the

serous effusion in Dr. Mulhall's case remained serous throughout the entire attack of influenza, the effusion thus escaping infection by pus-producing organisms. I have been inclined to consider that serous exudates were particularly apt to become purulent when the patient passed through any of the infectious diseases like influenza.

Dr. J. C. Mulhall: I thought that in the case I have related the worst possible thing was to use compressed air. Waldenburg has long ago called attention to the effect of dilating a lung that had been compressed by pleural effusion. I thought in such cases the increase of good breathing was more manifest in the increase of the diameter of the sound lung. I cannot see how a few minutes use of the cabinet two or three times a week can produce any effect in an undilatable lung.

After I had tapped this man I was unable to detect any vesicular murmur whatever.

A CASE OF TRAUMATIC CARDIAC NEUROSIS.

By J. C. MULHALL, M.D.,
ST LOUIS.

Miss Carrie W., school-teacher, aged twenty-six years, when I called on her in January, 1893, was suffering from a peritonsillar abscess. On recovery she came under my care for treatment designed to prevent recurrence of this trouble, from which she had been a frequent sufferer.

Bearing in mind rheumatism as a possible etiological factor, I examined the heart while the patient was erect and recumbent for evidences of endocardial changes, but with negative result. The patient did not remember to have had symptoms of rheumatism, and her general health had always been good. General irregular thickening of tonsils, adherent to the soft palate, existed. Curette and scissors were employed with a view to remove every vestige of tonsil tissue. The patient lacked courage, and permitted very little to be done at a sitting. Treatment was, therefore, prolonged over quite a period of time. At one visit she complained of shortness of breath, and I again examined the heart, but with a negative result. Flatulence, following a hearty lunch eaten late the previous evening, explained the sighing respiration. I mention these two examinations of the heart since they have an important legal bearing on what is to follow.

One day, three months later, she entered the office, bearing the marks on her face of several superficial incised wounds. She seemed anxious and frightened, not, as she explained, because of these slight cuts, but because of a sensation in the region of the heart, which she had never before experienced.

It was, at times, that of a fluttering bird; again, a sense of weight or constriction, and was accompanied by sobbing respiration, but no true dyspnœa. As she was originally of highly emotional temperament, her sensations had produced within her profound alarm. She stated that whilst occupying the most forward seat on the west side of a cable car going northward, another car proceeding eastward, and therefore unperceived by her, had collided with the car in which she was seated, throwing her forward with sufficient violence to shatter the window-pane. She was so agitated at the time that she could not recall many details, but did not remember any concussion to the wall of the chest, though she recalled the fact that her heart-symptoms had occurred at once. Examination disclosed no contusion of the chest wall, nor was there tenderness on pressure. There was no thrill on palpation, the impulse was feeble and the apex-beat not displaced. The pulse was small, feeble, irregular, and, after the patient had rested fifteen minutes, still ninety per minute. The pitch of the pulmonic second was higher than that of the aortic; its intensity equal. In the mitral area the first sound was feeble, and accompanied with a loud murmur. As one approached the axilla and angle of the scapula the first sound was lost, being entirely replaced by the murmur. It bore the characteristics of a hæmic murmur, but was of much greater intensity.

She was ordered to rest from her work, and given tincture of strophanthus in five-drop doses four times daily. At the end of a week the præcardial anxiety occurred at longer intervals, and she was able to partially resume her duties. At the end of three months she had no subjective symptoms, unless overworked or the participant in some emotional disturbance, when either the sense of constriction or some tumultuous action of the heart was observed. The murmur was of much less intensity. At the end of six months all subjective symptoms had ceased and the murmur could only be heard, the patient recumbent. To-day, fifteen months from the time of the accident, there exist no abnormal physical signs or symptoms.

Six months from the date of injury she, through her lawyer,

presented a petition for damages, asking for seven hundred and fifty dollars, alleging loss of service and much physical suffering, with grave anxiety pending the outcome of the heart affection. The facts in the case proved negligence. My medico-legal brief recited the important fact of acquaintance with the condition of the heart before the date of injury, and the facts in the case immediately and remotely subsequent. My opinion was also stated that not only was there a general traumatic neurasthenia incident to railway collisions without discoverable marks of violence, but that this unstable nervous condition might be confined to one organ, as, for example, the heart. Malingering was out of the question, for, though she might deceive us as to the subjective suffering, she could not produce a mitral regurgitant murmur. She was, without suit, awarded the damages asked for.

The murmur in this case can hardly be explained on any other hypothesis than that there existed dilatation of the left ventricle and consequent non-approximation of the mitral segments, the result of a functional paralysis of certain cardial motor nerves.

DISCUSSION.

Dr. Beverley Robinson : We have all seen occasional cases where blows in and around the cardiac region have led to phenomena similar to those reported. I was conversing to-day with a gentleman about a man very prominent in polo playing and as a horseman, who was thrown last spring, striking his chest forcibly. He came to see me last summer, and at that time was undoubtedly suffering from pain and distress around the præcardial region, although absolutely healthy otherwise, and as my memory serves me, he then had a mitral murmur. I do not know whether he has this now or the præcardial pain. Such cases unquestionably occur. From a variety of causes, and occasionally from a blow, one may have a temporary murmur at the mitral orifice, and certain feelings of distress, temporary or more or less lasting. In cases following a blow, the rational and proper explanation is that there is a certain amount of paralytic influence over certain nervous centres controlling the action of the heart.

Dr. Frederick I. Knight: Speaking of shocks recalls the cases of blow on the pneumogastric. You remember the little experiment that Czermak used to play upon himself; he could stop his heart any time by compressing his pneumogastric. An interesting case in this connection came to my attention. It was that of a young man thrown violently while getting into a car, striking the chest over the region of the heart. Rapid action of the heart ensued some time after. According to the testimony of his friends, whenever he was examined there was rapid action of the heart. On examination there was found a slight systolic murmur in the pulmonic area. One of the medical experts in the suit for damages stated that the accident had resulted in a *rupture of pulmonary valves!* which, I am afraid, rather weakened the case for the applicant, though he ultimately got something, on the ground of its having been a nervous shock.

SYPHILIS AS A FACTOR IN DISEASES OF THE HEART AND LUNGS.[1]

By LEONARD WEBER, M.D.,
NEW YORK.

It is not my intention, Mr. President, to read before this Association an elaborate paper on this interesting and, in many respects, important subject; I shall give you the clinical history of a number of cases as they have been collected from my note-books, and follow them by remarks on their etiology, pathology, and treatment, and the conclusions I have come to by observing and comparing them with similar ones that I have come across in medical literature.

Case I.—Man, aged thirty-eight years, stout and active; tradesman. Chronic bronchial catarrh in trachea and larger bronchi, with much cough and sparse muco-purulent expectoration, and somewhat dyspnœic breathing, increased by exertion. Slight nasal catarrh, nasal passages unobstructed; no adenoid vegetations in the pharynx, pharyngeal mucous membrane shows a few fine cicatrices here and there; larynx apparently free from disease. Lungs show nothing abnormal, left ventricle of heart probably somewhat hypertrophied, urine normal. Dyspeptic troubles now and then, probably due to beer and tobacco, which patient is using habitually and freely. Admits having contracted syphilis about twelve years ago, latent the past five years; but he suffers from neuralgias and periostitic pains from time to time, and there is now tenderness on pressure over manubrium sterni, though neither dul-

[1] Read by title and not open to discussion.

ness on percussion nor other symptoms of mediastinal tumefaction.

Diagnosis. Chronic bronchial catarrh with swelling and thickening of mucous membrane, and infiltration of submucous tissues of syphilitic origin in his trachea, reaching down as far as the bifurcation at least, by which the calibre of the tube has been somewhat reduced. Inasmuch as the patient has had specific treatment in a desultory way only, so far as he remembers, I put him first on the proto-iodide of mercury for a month, which he bore well enough, but from which he derived no benefit. It was followed by iodide of potassium gr. xv t. i. d., with gradual increase to ʒij t. i. d., and at the end of two months he seemed to be cured. There were frequent relapses, however, always controlled by the same medication, which relieved and practically cured his neuralgias; he passed finally out of sight.

Case II.—Man, aged sixty years, merchant, very active and energetic; he is a high liver and smokes considerably; and has had frequent colds and coughs by reckless exposure. During the last five years his colds are complicated by asthma, he says. Cough and fast dyspnœic respirations on slight exertion, accompanied by some stridor, have now been severe for some weeks; his cardiac action is increased, with pulse hard and full. On first seeing the patient, my impression was that he must have emphysema, but this was shown to be fallacious. I found marked tenderness and dulness over sternum; enlargement of the ascending aorta (*i. e.* aneurisma verum); systolic aortic murmur indicating some obstruction of ostium or atheromatous disease of ascending aorta or both; hypertrophy of left ventricle and tracheal bronchial catarrh, with probable hypertrophy of the mucous membrane. However, respiratory obstruction might be caused by pressure of anterior mediastinal growth (gumma) on the trachea or by laryngeal catarrh, which was also present in this case. Although the patient denies syphilis, he shows suspicious copper-colored cicatrices on the legs; and has rheumatoid pains in various muscles and nerves, and frequent

headaches. By the use of iodide of potassium in slowly increasing doses and small doses of chloral hydrate and codeia to relieve his cough and distress, the patient improves considerably within four weeks. He then goes home to continue this treatment, to which his family physician agrees. I have heard from him several times and seen him twice during the past four years. He looks better, feels better, but is not cured, inasmuch as he suffers frequent relapses, but he is always much relieved by taking a course of the treatment indicated.

Case III.—Man, aged twenty-eight years; mechanic. When he first came under my observation he had contracted syphilis about two years before; it is still manifest by various mucous and cutaneous lesions, readily yielding to a course of the proto-iodide of mercury. His father died of tuberculosis; his mother is alive and well; one of his brothers died of it; his younger brother has the disease. At the age of thirty years he is apparently free from syphilis, but examination shows an infiltration of the right apex, and he soon has slight hæmoptysis. Creosote does him good; he improves; he marries against my urgent advice. The first child died at three months of infantile convulsions; his second is alive at three years, but has had and still has hereditary syphilis, which yields to treatment. The man died of pulmonary tuberculosis the past summer; his wife, healthy and strong when she married him, became infected with tuberculosis last autumn, and is now in the last stage of it, but never showed any signs of syphilis. It is safe to say that in this case the destructive work of the bacillus tuberculosis was accelerated by the damage the syphilitic virus had done the system previously; while, on the other hand, the syphilitic, disease, though made latent by specific treatment, was still active enough to infect the offspring.

Case IV.—Man, aged fifty years, merchant, when I first saw him, various symptoms of scrofula in childhood; venereal sore at twenty-two, which took some weeks to heal, but was not followed by any of the usual symptoms of constitutional syphilis. After thirty he gradually lost the hair on his head; was frequently troubled with eczema *puden-*

dorum et ani, and with boils on various parts of the body, all thought to be of gouty origin, but careful and prolonged treatment based on this supposition did no apparent good, and the skin trouble followed him through life more or less. His complaints at fifty were those of some dyspnœa on exertion, dry cough, liability to slight and febrile bronchial catarrh, heart palpitation, and poor sleep. The heart was found to be greatly enlarged in all dimensions, with rather strong action; fast but regular pulse, but no murmurs. The diagnosis of the syphilitic origin of this patient's cardiac disease being uncertain, and, moreover, the iodides not agreeing with his his stomach, this treatment was abandoned. He lived to be sixty before he showed decided cardiac failure, and died of pulmonary infarction caused by heart disease.

The autopsy of this case revealed bovine heart with enormous hypertrophy and diffused, but not very advanced fatty degeneration. The valves were sound; aorta wide, its walls not hypertrophied, rather thin comparatively, with various inextensive endarteritic changes of atheromatous character. Kidneys somewhat enlarged and hyperæmic, but not diseased; liver enlarged, showing a few small cicatrices on the upper surface of the right lobe; ascending colon greatly distended, adherent at the hepatic flexure.

Case V.—Man, aged fifty-eight years; physician, vigorous and active, in practice for many years, and now in fairly good health. No hereditary taint. At nineteen slight gonorrhœa accompanied by slowly developing and slowly healing lymphatic abscess in one groin. At twenty-two veneral sore some days after cohabiting with a woman, which he found soon after to have been in the first stage of constitutional syphilis. He destroyed the sore with caustic potash; it healed kindly and without apparent induration, and was not followed by any syphilitic symptoms that he remembers. He married a year or two thereafter a healthy but hysterical woman. The union remained without offspring, nor had the wife any abortions. His wife died some years ago of acute illness brought on by exposure, and he remained a widower, leading an active

and pure life, moderate also in eating and drinking. Though becoming prematurely bald, he has had no cutaneous diseases, but some crops of boils now and then; his frequent headache was thought to be of lithæmic origin. From his forty-second year on various neuralgias and rheumatoid muscular pains developed, and, in 1887, some symptoms of overtired heart. It was then that I examined him first and found a weak heart; weak pulse; apex-beat just perceptible when at rest. On bending forward percussion dulness showed slight increase of cardiac area to left side; no false sounds, but an irregularly intermitting pulse. Knee-jerks weak; pupillary reaction to light slow. All muscular movements prompt; grasp good; walk steady and firm; but abnormally early and painful fatigue on prolonged exertion, such as walking and riding. I said to the Doctor: "Your trouble may be functional weakness only, caused by severe and exacting work these many years; but there might be, nevertheless, beginning cardiac muscular disease; and, if so, it is more likely caused by the toxins of previous, though latent, syphilitic poisoning. You might after all have what Fournier designates as para- and Mœbius as meta-syphilitic lesions in you, which manifest themselves in your case by cardiac and nervous disturbances. Take iodide of potassium in small doses for a year or more, and of sulphate of spartein and extr. nucis vom. spir. āā gr. $\frac{1}{4}$ twice daily for two weeks at a time whenever your heart appears to be particularly weak." "Well," said he, "I believe the iodide to be a heart-tonic anyway, and consider your advice sound and will follow it." He has done so with profit, though he has still well-marked alternating pulse from time to time; he is quite alive and active in the pursuit of his profession, but he has to avoid prolonged physical exertion on pain of distress and suffering.

CASE VI.—Woman, aged forty-five years, when she died under the symptoms of uræmia caused by chronic interstitial nephritis and atypical tabes; the latter was undoubtedly caused by para-syphilis of the vascular and nervous system. When married at the age of eighteen, she was a particularly

healthy and fresh girl without hereditary taint or blemish of any kind ; her husband had had syphilis, but believed himself entirely well, and appeared to be so. She soon became pregnant and gave birth to a seven months' dead child, the body of which was not examined. Soon after that symptoms of subacute broncho-pneumonia in the upper lobe set in, by which she had lost much in health and strength, when I first saw her in consultation with her attending physician, who believed that she might have pulmonary phthisis. By repeated examinations of her case it became clear that we had to deal with an indurative inflammatory process of a limited portion of the lung-tissue, but not with pulmonary phthisis. The possible syphilitic origin of the trouble was not discovered at that time. The patient gradually recovered by proper local treatment and change of climate. However, when I saw her again, about five years later, she was by no means the same in health and vigor that she was before she had married. There was some degree of cachexia about her, though she did not complain. Lungs appeared to be sound. Slight pustular eruption about the scalp going and coming, but growth of hair remained full and vigorous. I lost sight of her until about 1882, when after having been a widow for some years she became married again to a man whom I knew to be free from syphilis. She aborted two or three times within three years, and then showed the signs of interstitial nephritis coming on very insidiously, with never more than about two per mille. of albumin up to the time of her death. From 1887 on some signs of functional disturbance of the heart's muscle or cardiac nerves, or both, and decided symptoms of atypical tabes, such as pupillary failure ; shooting pains ; sciatica of one side ; increasing motor weakness ; diminished tendon-reflexes ; later on slight vesical paresis ; and during the last two years of her life weak and irregular pulse. To be sure, specific treatment was instituted as soon as I recognized the presence of post-spyhilitic disease, but the iodides were neither well borne nor did they do any apparent good, and mercury was out of the question on account of the involved state of the patient's kidneys.

CASE VII.—Man, aged thirty-eight years; clerk; contracted syphilis at twenty-four. It ran no unusual course; he was treated for three or four years with mercury and the iodides. It then became latent, leaving the patient in a generally reduced condition, though fully able to attend to his business. He is positive that he has had more proneness to colds and coughs afterward than before, and they clung to him and required medicinal care. He came to me on account of these catarrhs of his naso-bronchial passages in 1890. At first examination I found left antero-thoracic retraction and other signs of broncho-pneumonia chronica and pleuritis concerning the left upper lobe, with much cough and some muco-purulent sputa containing neither blood nor bacilli. No fever at any time; general health good enough. I diagnosed the broncho-pulmonary condition to be of syphilitic origin, and treated him accordingly with good results. In the winter of 1892 and 1893 he relapsed, showing at the same time slight but unmistakable specific periosteal and cutaneous lesions. Mercurial inunction and the bathing cure at Hot Springs, Ark., was followed by very marked local and general improvement. Last March there was an exacerbation of the old broncho-pneumonic trouble, sputa showing numerous pus cells, strepto-staphylo- and pneumococci, but no bacilli; there was very little fever. Creosote appeared to be indicated now besides the usual treatment for acute affections of this kind, but no specific remedies were ordered. The patient improved again, but on my advice went to Colorado, where he found employment, and is now in fairly good health according to his own reports.[1]

Such cases, when of long standing like the above and having led to considerable proliferation and consecutive retraction of connective-tissue, are generally associated with some bronchectasis and pleuritic adhesions, and while they are amenable to specific combined with other suitable treatment they have passed the stage of a *restitutio ad integrum*.

[1] This belongs to the class of cases reported in an excellent paper by Dr. T. E. Satterthwaite, of New York, entitled "Pulmonary Syphilis in the Adult," published in the Boston Med. and Surg. Journal, June 11 and 18, 1891.

I will not tax your patience any more by giving further cases in detail, but will state in a general way that I have the history of some more cases of cardiac and aortic disease in the form of cardiac muscular gumma or more or less diffused infiltration and induration of muscular tissue, with and without subsequent softening and rupture, and accompanied by more or less severe symptoms of angina pectoris, terminating suddenly or by complications or through general cachexia. Aside from the baneful influence of the syphilitic virus, or its later modifications, upon the direct or indirect production of peculiar forms of chronic bronchitis and indurative forms of pulmonary inflammation, which, after all, does not appear to me of frequent occurrence in practice, I do believe that muscular cardiac as well as arterial disease in the form of endarteritis chronica, is much more often of syphilitic origin than is commonly held; and that the diagnosis of this relationship can, in many cases, be made by exclusion or *ex juvantibus*, but sometimes not without difficulty. And truly we may not wonder at the doubts and difficulties presenting themselves in the clinical observation and estimation of such cases when we know that the pathologists can demonstrate, indeed, a gumma in the lungs or any other viscera with certainty, and designate the white hepatization of consolidated lung-tissue, now known as the "white pneumonia" of syphilis, as a distinctly syphilitic product; but that they cannot at all be equally positive in recognizing the many chronic inflammatory, sclerotic, and ulcerative processes occurring in various parts of the body in the course of chronic disease, such as alcoholism, saturnism, hydrargyrosis, arthritis urica, syphilis, etc., as being caused by one particular kind of poison, and not by another.

By the syphilitic infection the system is contaminated, and, in the majority of cases, the individual experiences a loss in the power of resistance to morbid agencies that come to act upon him in the wear and tear of life, and which might other-pass him by or leave him uninjured. To look upon syphilis as a comparatively benign disease, when properly treated,

seems to me absurd in the light of the countless observations to the contrary made in modern times by the clinical study of paresis, tabes, and other diseases of the nervous system, and of the heart, the arteries, the liver, etc. If the syphilitic virus, as such, cannot make any of those diseases, probably the poisons produced by it in time will do so, and, no matter how you may look upon the appalling statistics of Fournier, Erb, and others, you cannot explain away the fact that previous syphilis creates a predisposition to severe disorders of the nervous and vascular system.[1]

Why is it that not one of the one hundred and more cases reported at that time, and of many more which I have had under my care since, has thus far had paresis or tabes when proper treatment was adhered to for as many years as may have been required in a given case? It is, I believe, because the treatment has been adequate to the necessary destruction of the syphilis virus, and to the extent of preventing subsequent damage to the system by its toxins or otherwise; and *per contra*, Mr. C. S. and Mr. F. W., two patients of mine, who were led to believe by another practitioner that their trouble was not syphilitic, died; the one of syphilitic hemiplegia at the age of thirty-eight years, the other at forty-three of acute pulmonary trouble caused by syphilitic lesions of the pulmonary artery (first described by Prof. von Dittrich, forty years ago); and another patient, J. B., aged 46, who died of paresis last April, after being ill with it for three years, had acquired syphilis in 1882, but, unfortunately for himself, was refractory and could not be held to a regular course of treatment; and W., aged thirty-two years, manufacturer, now confined in an asylum on account of paresis, had acquired syphilis at twenty-four. It was unfortunately mild, and he remained practically untreated. Quite recently I saw the dreadfully sad case of a gentleman of forty, merchant, with-

[1] That this is eminently so in cases of syphilis that have been carelessly or insufficiently treated I am firmly convinced and have shown, I believe, in a paper entitled "Syphilis and Locomotor Ataxia," read before the Academy of Medicine of New York, and published in the N. Y. Med. Record, April 5, 1884.

out a hereditary taint, who had never been ill in his life, but had a venereal sore about fifteen years ago, not followed by any marked symptoms of syphilis. Five years ago he began consulting opthalmologists, and has now well-marked progressive atrophy of optic nerves and symptoms of tabes. We are told by busy ophthalmologists that optic atrophy and amaurosis are often early symptoms of tabes.

Bronchial, pulmonary, cardiac, or arterial disease of syphilitic or post-syphilitic origin is, indeed, amenable to treatment in many respects, but it will be far better for the welfare of a syphilitic patient to expose him to the minimum chance of getting severe forms of visceral lesions by treating the original disease energetically and with as much care and perseverance as the case may require.

ETIOLOGY AND TREATMENT OF CERTAIN KINDS OF COUGH.

By BEVERLEY ROBINSON, M.D.,
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Cough is one of those symptoms we are called upon constantly to treat. At times the diagnosis of its cause is relatively easy, and our treatment satisfactory. It may last, it is true, for some days despite our efforts to relieve, and during this time cause moderate annoyance, or even considerable distress. Still, after a fair trial of remedies judiciously employed a measure of benefit is obtained, and both patient and physician are hopeful as to a speedy cure, and both are tolerably satisfied with the amount of success accomplished in a given period. Again, there are cases in which we know from the first that whatever treatment may be followed the obstinate cough in the nature of things, must persist, and arrest, except from increasing doses of anodynes, can rarely be effected. Such cases we are familiar with in certain forms of pulmonary and laryngeal phthisis.

There are other kinds of cough which are also met with quite frequently; yet their diagnosis is made with difficulty, and their treatment, despite repeated changes, fails to accomplish much in the way of abatement and cure. This is true not only of the patients who go first to the family physician in search of help, but also of those who in the beginning of their trouble gravitate toward some prominent specialist.

In the class of cases where the general practitioner is usually at fault I would place the cough which is under dependence of an engorged lingual tonsil. On at least two occasions I have treated wives of prominent medical practitioners who were sufferers from annoying symptoms of this origin, although previous

to my seeing and treating them the nature of the trouble had not been recognized. In these cases there was no chest affection and no apparent throat trouble sufficient to cause the distressing cough, or other symptoms. There was no evident local disease elsewhere in one case; in the other there were joint symptoms of rheumatic gout. In one case the cough had resisted many usual remedies given internally, and the repeated employment of sprays and inhalation of balsamic vapors.

The cough in these cases is frequent, dry, paroxysmal. Anodynes, even in moderately large doses, fail to afford relief. At times the cough is occasioned by the sensation of a foreign body lodged at the base of the tongue, like a bristle, a bread-crumb, or a bit of meat, but it is impossible to dislodge anything or get rid of the annoying sensation.

Accompanying the cough there may be a continuous desire to swallow constantly, and the effort of deglutition may be performed with some difficulty. Indeed, I have had one case under my care in which the difficulty of swallowing was so great as to excite much apprehension lest choking should occur, and the young woman soon lost flesh and strength to a marked degree, through dread of taking her meals. With the difficulty of swallowing there may be a feeling of a constricting hand around the throat, which occasionally seems as if it would throttle the patient. This sensation is greatly increased when the patient lies down at night, and of course increases his terror.

But these are very exaggerated cases, and frequently nothing betrays the evidence of local irritation of the larynx from lymphoid hypertrophy at the base of the tongue, except an almost continuous cough. I have known such cases to be regarded for some time as phthisical and again as hysterical.

When the obstinate cough is thought to be evidence of incipient phthisis, change of air, absence from business or household cares, cod-liver oil, and creosote begin to loom up as the only remaining means of helpfulness. If the patient be supposed to suffer from hysteria—and how often is the so-called "globus hystericus" made to account for what is caused by pressure from an offending mass—little or no treatment is insisted upon. The patient is often spoken of as an imaginary sufferer, for whom a

cold douche, valerian pills, and some moral education sum up about everything which can be done.[1]

When these cases are examined with the laryngoscope, and it is only with the laryngoscope that they can surely be made out, we note the following conditions: The epiglottidean fossa, *i. e.*, the fossa between the epiglottis and the base of the tongue, is more or less completely filled up and distended by a slightly irregular but rounded mass of lymphoid tissue. This mass is sometimes deep red, sometimes pink, and again pale in color. It is often covered with irregular cauliflower excrescences not larger than a very small pea. Again, it is relatively smooth and glistening like certain forms of enlarged faucial tonsils in children. The mass may simply fill the fossa, pressing against the entire anterior surface of the epiglottis; or it may be so much larger on one side than it is on the other that the pressure on the epiglottis is only partial, and on the opposite side to the one where this is evident the fossa is not wholly filled up. Frequently the free border of the epiglottis is, to a more or less considerable extent, caught in or covered by the overtopping tonsillar mass; and it would seem to be particularly this portion of the mass which occasions the troublesome cough. When the patient phonates the mass occasionally separates from the free margin of the epiglottis; occasionally it shows no separation at all, but adheres under vocal efforts closely to it.

Frequently there are quite large veins distinctly defined on the tonsillar mass, and not seldom these veins will burst and allow more or less blood to come into the mouth and be expectorated, which I have known to cause the liveliest apprehension on the part of the physician and the patient. Fortunately, the bleeding soon stops, and the patient is none the worse for it, except mentally.

These enlargements of the lingual tonsil are uncommon among young children; they are also infrequent among young men and women; but toward middle life, in men and women, I have had numerous cases—more among women than men.

The causes of the enlargement are certain menstrual derange-

[1] I am more inclined to the belief than ever that the nervous cough of adolescents described graphically by the late Sir Andrew Clarke was simply a cough caused by an enlarged lingual tonsil.

ments, continued constipation, and an underlying rheumatic or gouty state. No doubt, micro-organisms may infect as readily, perhaps even more easily, this tonsillar mass than they do those masses at the faucial entrance.

In rare cases syphilis has doubtless localized itself in this region, either causing marked hyperæmia or a congestive condition, upon which a mucous patch may readily develop, as it does upon the faucial tonsils.

How should we treat this engorged lingual tonsil? Internally, we must give the salicylates in fairly large doses, and usually we shall obtain from their use very evident benefit. It is not essential in giving the salicylates to be able to discover some other manifest rheumatic symptoms; nor, indeed, should we feel compelled to obtain a clearly rheumatic history. Despite the absence of either the one or the other, we often get good results from this treatment.

In prescribing salicylic acid or the salicylates, it is very important to get salicylic acid obtained from the proper chemical source. That made directly from the oil of wintergreen is the only one which is safe and judicious to use. The other is very apt to cause pain and nausea, or other symptoms of stomachal intolerance. While I believe sprays of some benefit, especially those of carbolic acid combined with the essential oils and boric acid, still these will not cure by themselves the lingual hypertrophy. Local applications of a stronger kind are necessary. Among these, I place foremost the galvano-cautery and compound tincture of iodine.

Excision of the tonsil by a specially devised knife or guillotine (Chappell's) has been recommended highly by a few prominent throat specialists, but thus far has not commanded general favor. The site of the disease makes it awkward for operation with the guillotine unless it be imperatively required, and the risk from annoying bleeding, or some other accident following excision, is not, in my judgment, as small as has been affirmed. Formerly, I treated these cases with repeated applications of the galvano-cautery, and, upon the whole, my results were gratifying; still, owing to the soreness and swelling which lasted for several days

subsequent to the use of the cautery, I had reason occasionally to be troubled in mind.

I do not remember to have had an abscess from the peritonsillar structure after cauterization, but I know that several times the tonsil was so much inflamed that I sought relief for my patient through repeated lancing with a curved knife.[1] The great objection, however, to the use of the cautery in this region is the risk of burning the epiglottis, and particularly its free border. Unless the patient is phlegmatic and obedient, and holds himself very steadily, we may inadvertently produce an ugly sore which will give any amount of trouble before it heals.

Latterly, by repeated applications of compound tincture of iodine to the tonsillar mass with a curved brush or sponge-holder, and by the use of the salicylates internally, I have been able in a few weeks to reduce these enlarged tonsils so that they ceased to occasion cough or other symptoms of local distress. The applications of iodine may be repeated daily with considerable advantage, or as frequently as can be made without causing marked local soreness. Even when the cough disappears, or the obstructed deglutition is no longer present, the voice may be more or less hoarse and discordant for some time.

In using the galvano-cautery it must always be borne in mind that an unfortunate burning of the margin of the epiglottis may bring on a cough even more troublesome than the one we are trying to cure, and for this reason, after considerable experience, I am inclined to reserve its use for those cases in which internal treatment and the local use of compound tincture of iodine remain without curative effect.

Another form of cough occurs in young children, and is often ignored, or, if not ignored, the treatment is at least ineffectual, as it does not reach the cause of it. Frequently children cough repeatedly, and at night especially, on account of one of two conditions: either there is a dropping of thick mucus, or mucopus, from the nasopharynx upon or into the larynx, or there is an irritation of the posterior turbinated bodies brought on by

[1] I have had two cases under my care in whom an abscess formed in this tonsil, and after causing great distress, *i. e.*, dyspnœa and choking, burst spontaneously, to the great and immediate relief of the patients.

local congestion. The first condition is made evident frequently by the examination of the pharynx with an ordinary tongue spatula. So soon as the tongue is moderately depressed the child has an effort of gagging, and a large mass of mucus is seen between the free border of the palate and the pharyngeal wall, squeezed downward by the forced effort which just precedes its appearance. Usually this condition in children is due to more or less development of the pharyngeal tonsil or lymphoid tissue at the vault of the pharynx. It can be cured by a moderate scraping with the finger-nail of the right index-finger introduced behind and above the soft palate. If the finger be properly protected by a thick rubber nipple (*i. e.*, such a one as is used to cover the mouth of a nursing bottle) it will not be wounded by the child's teeth. No anæsthesia is required. The pain from the scraping is very slight, and the operation lasts but a few moments. To be thorough, two or more scrapings should be made at the time, or if the child is very restive after the first operation further interference may be delayed until a later and more favorable occasion. In some of these cases there is quite an amount of bleeding for a few moments during and immediately after the operation; but in my experience it has quickly ceased. If it were to continue I would advise swabbing the post-nasal space with a little of Mackenzie's tanno-gallic powder (three parts of tannin and one part of gallic acid). Indeed, I have made this application on more than one occasion as a simple matter of precaution, and with obviously a satisfactory astringent effect.

In the event of the hemorrhage being at all abundant or continuing for any length of time, the proper thing to do would be to place a plug of iodoform or sterilized gauze in the post-nasal space with the finger or a pair of post-nasal forceps, allowing a string to remain attached, so that the tampon could be removed at any moment it seemed advisable to do so.

For a few days subsequent to the scraping it is wise to spray the nasal and post-nasal passages with a mild antiseptic spray composed in part of carbolic or boric acid.

Sometimes there is really no adenoid tissue in the post-nasal space to account for the obstinate cough, and there is practically no hypersecretion of mucus or muco-pus from this region.

The nasal passages may be either tolerably pervious, or they may be notably occluded. Sometimes the occlusion is but little noticed in the day-time, but at night it becomes greatly aggravated, and especially when the patient is lying on his back, he is restless and uncomfortable, throws himself about in bed, coughs frequently, and yet apparently there is not sufficient evidence in an ordinary inspection of the fauces and pharynx to account for these morbid phenomena.

At times the cough is relieved very much for some time by a suitably formulated nasal spray or a few applications of moderate severity to the nasal mucous membrane.

I have found albolene with camphor and carbolic acid one of the best combinations as a spray or vapor, and applications of carbolic acid and glycerin (from 1 part to 8 to equal parts of each ingredient) as the most useful local application by means of a nasal carrier, I have hitherto employed in these cases.

Whenever the cough is not altogether relieved by these means used in the manner referred to, I find it is most useful to paint over the posterior end of the turbinated bodies (as much as I am able), and also the vault of the pharynx, with carbolic acid and glycerin (1 part carbolic acid to 6 or 8 parts of glycerin). In this way we are able surely to relieve the congested condition which is so distressing, and no doubt, by diminishing the sensitiveness of the peripheral nerve filaments here distributed, to cure the reflex attacks of coughs which have proved so distressing.

It is most important, however, in just such instances to avoid overloading the child's stomach at bed-time with heavy, rich, or, indeed, too abundant food. A light supper, mainly composed of bread and milk, with a little stewed fruit, is about all that such a child should be allowed to take at its evening meal. If the liver be engorged from a too large food supply, the result is temporary blocking of the circulation; and hence, in many cases, nasal obstruction and cough. Am I not borne out in my statement when many of us acknowledge that certain cases of frequent, obstinate nasal hemorrhage are only permanently arrested by a rigid dietary and repeated counter-irritation, or depletion over the hepatic region?

Just in the same way as a hyper-sensitive area may be dis-

covered in some portion of the nasal passages or nasopharyngeal space, so I find occasionally sensitive areas in the pharynx, in the tonsillar region, upon the soft palate, in the hyoid, or epiglottidean fossa, which will occasion cough as soon as we touch the irritable point.

In what manner it is best to destroy these areas of cough is hard to affirm absolutely. Sometimes I have found one agent, sometimes another, relieve most. Nor is it always true that astringent or caustic applications will do better than soothing anodyne ones, or *vice versa.*

All local remedies at times remain futile, and cough persists and annoys until an entire change of air and scene are obtained.

Of the internal remedies from which I have derived most benefit, I would mention codeia and terpin hydrate. Codeia does not simply relieve hyper-sensitiveness for a while, it is also directly curative; moreover, it does not constipate the bowels much, as a rule, or upset the stomach, as morphine or opium almost invariable do. Terpin hydrate may have, in addition to its well-known modifying action on diseased mucous membrane, a mild antimicrobic power that perhaps is useful. It always remains true that codeia in doses of gr. $\frac{1}{10}$, more or less frequently repeated, and terpin hydrate in tablet form of 1, or 2 grs. each, every two or three hours, given internally, have been of great service in my hands.

I have not been able to determine invariably the cause of these sensative areas. I meet them occasionally in young girls of marked nervous temperament, who are also anæmic and somewhat exhausted from too much work, study, or pleasure. I also encounter them when the general health is excellent, and it is impossible to get at a satisfactory efficient cause.

Every practitioner is familiar, at least theoretically, with the fact that paroxysmal cough may be occasioned by irritation in the auditory canal. Most physicians have known the mere introduction of a probe or ear speculum to be followed by an outbreak of cough, which only terminated when the offending instrument was withdrawn. Sometimes the condition of the ear is such that we can readily account for cough produced by examination, or, indeed, for the cough which previous to the aural ex-

amination had remained a great mystery. Frequently, an impacted mass of cerumen explains the cough, apparently, and after complete removal of this substance the cough will speedily disappear.

There are numerous occasions, however, in which there are no impacted cerumen and no symptoms of aural disease prior to direct investigation by the physician. Then it is, and only then, that we first discover that there is some impairment of the auditory function. But what interests us particularly to state is that, one or more points of the auditory canal are especially sensitive, and appear to have some connection with the appearance or continuance of the cough. In any event, when the sensitiveness of the aural canal is diminished by suitable local applications, the cough tends to diminish or disappear. The point most frequently sensitive is that on the posterior inferior wall of the canal very close to the membrane of the tympanum. Accompanying this sensitiveness, there is pronounced redness of the surface of the canal, with slight furfuraceous exfoliation of the cutaneous layer, which shows distinctly inflammatory action.

Repeated applications of alcohol, or a mild solution of bichloride of mercury (1–1000), or of nitrate of silver (1–100), will cure this condition after a time, as well as ameliorate, if not cure, the paroxysmal cough from which the patient suffers. In many such cases, however, there is a marked lithæmic condition, and we will help not only the condition of the auditory canal, but also the secondary or concomitant congestion of the pharynx and larynx by frequent doses internally of lithia and bicarbonate of potash, together with some heart tonic like caffeine, which is also useful in promoting urinary excretion.

Of course, in many cases like those of which I have been writing, the aural inflammation and a catarrhal condition of the upper air-passages, with marked increase of secretion, may exist together, and it is almost impossible to say that the ear is in any sense the source of the cough, as this symptom may be wholly caused by an independent laryngitis or tracheitis which is present.

In speaking on this subject of aural reflexes, it may be remarked with a feeling akin to surprise how no attention is paid to it in late editions of works on aural disease, like Politzer and Buck;

Dench, it is true, speaks about the reflexes originating in the auditory canal, in his chapter on impacted cerumen, but, so far as I could discover, nowhere else;[1] and yet it is a matter of common knowledge, almost, that "ear cough" exists. Despite this statement, I trust in a practical way my reference to it in this paper may still be found suggestive and useful.

One of the most interesting facts connected with cough—originating evidently in the upper air-passages—is how little we can judge, at times, of the source or nature of the cough from visible appearances; some of the worst-looking throats give, at times, literally no symptoms, and, for one, I am disposed to regard these throats as usually, if not always, normal. Symptoms are evidences of disordered function, and are appreciated by our organs of sense and the reports given us by the patients themselves. If, therefore, none can be found and none are accused, is not this sufficient proof that the organ itself is probably healthy? Again, we shall have all the appearances of a healthy mucous membrane, and yet, strange to say, the patient is always complaining of abnormal or unpleasant sensations, or functional disability in the vocal muscles. These statements are not always exaggerated; they are probably often true, and, if rightly interpreted, lead us to a correct explanation and treatment of them.

Many years ago I reported a case of chronic laryngitis, which served to illustrate how the mucous membrane of the vocal cords may be in an objectively morbid condition, though their physiological functions be restored (*American Journal of the Medical Sciences*, October, 1875). In an analogous way, I might also show at present how certain patients affected with redness and swelling of the larynx cough a great deal, and others do not. Of course, we can readily affirm that in the one case there is some point of continuous irritation elsewhere which causes constant cough, and in the other there is not. Such explanation is, however, nothing more at times than a surmise, and we are thrown back upon our inadequate knowledge at present to give a complete and satisfactory solution of such examples.

[1] I do not wish to mislead, so that I would add that Dench has a most excellent chapter on "Aural Reflexes," but all due to disease elsewhere, and not in the canal itself.

In just such instances I have found the best curative effects in a change of air and scene. I am not confident that it is of essential importance that the change shall be from the city to the country, or to a seaside resort. Sometimes the change from one city to another will rid the patient of an obstinate cough which may have lasted for weeks, and resisted much and various medication. Frequently, however, I send these patients inland to breathe the air of pine forests, and where the soil is porous and well drained, and thus obtain most satisfactory results. I know, however, of one seashore resort, *i. e.*, Atlantic City, N. J., which even during the winter months has been most beneficial to cases of "cough" which had resisted other remedial agencies. The special value of this shore climate appears to consist, singular to relate, in its relative dryness as compared with many other places on the ocean.

In the early spring there is nothing which will remove a harassing cough of this kind sooner than a few days' trout-fishing with rod and reel. In the summer, when I am able, I like to send those who cough obstinately to some good sulphur-spring, as I am satisfied that not only the air in the vicinity of sulphur-springs, but also the sulphur-baths and inhalations are very useful in building up impaired nervous constitutions in which such coughs often predominate.

Alongside of these individuals there are others who are apparently in good health and yet are constantly hawking, coughing, and expectorating. Usually these patients are lithæmic to an intense degree, and after a while the lithæmic state is complicated by the presence of an elongated palate and a thickened, congested pharynx and larynx. Lithæmia, if continuously neglected, may become, or find expression in, an evident rheumatic or gouty state. Under these circumstances it is not uncommon to find the mucous membrane of the upper air-passages much infiltrated. Frequently this extends far down the trachea, and tenacious mucus is pretty constantly present and is expelled with difficulty.

Such a condition and the cough dependent upon it is helped more by salicylate of soda or the salts of lithia than by local applications or anodyne cough mixtures. I have already on a former occasion pointed out the marked influence of malaria in

producing congestive conditions of the respiratory passages which occasion rebellious cough. This manifestation is often with difficulty traced to its cause, and medication alone seems to establish the diagnosis.

In a few such cases it has seemed evident to me that quinine and arsenic would not benefit, when bark, in tincture or fluid extract, frequently repeated and in sufficient dose, was certainly curative.[1]

The obstinate cough due to a dilated heart, or one affected at the orifices with organic changes, is very frequent and should be constantly kept in mind. Not seldom, when I have not known what else to do, I have freely stimulated a somewhat weak cardiac action and thus stopped a bad cough in a few days. Previously the patient had taken numerous medicines, with little or no benefit. It is not always possible to make out any cardiac murmur, but it is indicated in these cases occasionally to give heart tonics, even more than if a loud murmur were present. The result is indeed very surprising at times, and the cough disappears very rapidly.[2]

Instead of the rheumatic dyscrasia affecting the joints it may lodge itself in serous membranes like the pleura or peritoneum. In attacking the pleura it produces only slight pain at times, and for this reason, doubtless, no recognition of the cause of cough is made out. I have also known a case where the ear could detect little or nothing by auscultation, and yet I felt sure, through repeated observations and treatment, that pleuritis was the cause of the cough. One or two small fly-blisters locally applied in the beginning aborted the attacks and very soon the patient was well. Sometimes the merely mechanical action of an enlarged spleen or liver pressing on the diaphragm will occasion cough. By slightly forcing these organs downward and inward, a paroxysm of cough may also be occasionally produced.

[1] In this connection I would remark that certain cases of pneumonia are evidently malarial in origin. In one case I can now distinctly remember, in which Dr. Loomis was the consultant, the typical signs of pneumonia disappeared within twenty-four hours under antimalarial treatment.

[2] I meet occasionally with cases of evidently slight cardiac dilatation, characterized by a systolic bruit, which appear and disappear in a brief period. Fatigue causes them; rest and cardiac tonics cure them, at least for a time.

In these instances, a specially sensitive area is found over the lower margin of the liver or spleen.

In many instances of cough of various kinds I have obtained very great temporary relief from dry vapor inhalations of difrent volatile fluids. The best combination of this kind which I have hitherto discovered, consists of equal parts of camphor, menthol, and eucalyptus. This I use as an inhalation both for throat and nose. The addition of spirits of chloroform, as we all know, to these inhalations will be found often very useful.

In all cases of cough arising from severe bronchial inflammation, or in those from broncho-pneumonia, I am now strongly in favor of using inhalations of beechwood creosote mixed with steam. They are valuable in the cure of these diseases and relieve cough very much.

No doubt the antimicrobic action of the creosote is serviceable. In several instances of grip that I have treated I am thoroughly convinced that the cough of this disease was diminished more with inhalations of creosote than in any other manner. As a preventive means of treatment of cough I have no doubt in my mind that a resort like Hot Springs, Virginia, where we now are, is most useful. By making the skin and kidneys more active, and stimulating the function of the liver, these baths and the massage treatment which follows must render great service. In the bracing mountain air and the dietary control exercised by the resident physician we have additional useful influences.

DISCUSSION.

Dr. Babcock: I have in my desk at home a paper upon the subject of some unusual forms of cough, and Dr. Robinson's paper reminds me of two or three cases which I have there narrated. My first and only experience with lingual tonsil was in the case of a young married woman who came to me with a statement that she had been under treatment for consumption for a number of years, without any effect upon the cough, although the general health improved. Careful physical examination disclosed no pulmonary disease, and I referred her to a laryngologist. He discovered an en-

larged lingual tonsil, and the patient was relieved of cough by appropriate treatment with the galvano-cautery.

Dr. Robinson spoke of the influence of enlarged spleen and other abdominal viscera upon the cough. This reminded me of a case of a young woman who, two or three years ago, was referred to me because of chronic cough. Careful examination of the chest failed to reveal evidence of pulmonary disease, and on turning my attention to the abdomen I was surprised to find well-marked evidence of Glenard's enteroptosis.

The right kidney was partially prolapsed and movable, while the transverse colon had fallen downward, so as to uncover the abdominal aorta, which could be felt plainly pulsating above the umbilicus and to the left of the median line; moreover, passing across the epigastrium, from the left upward toward the right in an oblique direction, was a hard body of about the width of two fingers, which could be moved upward and would disappear out of reach. This was apparently the prolapsed pancreas, and, to my surprise, pressure upon it promptly excited an explosion of cough.

The patient complained but little of gastro-intestinal disturbance further than constipation. Treatment was directed to this symptom and relief of the enteroptosis by a mechanical support, and the patient lost her cough, although no expectorants or other remedies directed to the relief of the cough were administered.

Cough is also often a symptom of mitral disease, and is then generally due to pulmonary and bronchial congestion. I had a case last winter of a boy, twelve years old, suffering from uncompensated mitral disease, with very great enlargement of the left auricle, as well as of the right ventricle. There was from the first impaired resonance in the left infra-clavicular region with prolonged expiration, but no râles. Later on, while in the recumbent position of enforced rest in bed, he developed a very obstinate cough, without expectoration. An examination of the chest revealed, in addition to the impaired resonance just mentioned, numerous fine moist râles in the left infraclavicular region. There were no symptoms pointing to an active inflammation in that portion of the lung, although the physical signs seemed very suspicious of some such process. It occurred to me that they were probably due to pressure upon the left upper lobe by the enlarged left auricle. Accordingly, when the lad was allowed to sit up in bed, or, at least, assume a more erect position, so as to let the heart fall away from the lung somewhat, the râles gradually disappeared, coincidently with the cough.

Dr. F. I. Knight: In regard to this lingual tonsil, I certainly agree with what Dr. Robinson said about the possibility of its causing cough. In order to get relief, I have found it necessary to resort to

some destructive method, using the galvano-cautery sometimes; I never had any fear of burning the epiglottis. I have sometimes used the snare in these cases.

The case of Dr. Babcock is exceedingly interesting.

In this connection I had an interesting one: A young woman, eighteen or twenty years old, in apparently perfect health, had sharp, hacking cough, without expectoration; on examination of the heart, mitral stenosis; also fine râles at both bases behind. I felt quite satisfied that cough did not indicate disease of the lung. I think it is a fact that we do not often have tuberculosis developed in well-marked cases of disease of the heart; not that it is impossible, but you do not often see that association. I put her upon treatment, but without relief. She had no rise of temperature, and a very little expectoration developed. Finding some râles in the upper lobe of the right lung, I asked her to save the expectoration, and, much to my surprise, I found it filled with tubercle bacilli. There was no loss of flesh; no characteristic symptoms; nothing but incessant cough and dyspnœa.

P.S.—This patient has since died of an acute pulmonary congestion and œdema.

OBSERVATIONS OF ANTITOXIN IN DIPHTHERIA.[1]

By JOHN WINTERS BRANNAN, M.D.,
NEW YORK.

During the present year I have had the opportunity of observing an extensive and thorough trial of antitoxic serum in the treatment of diphtheria, and I have thought that a brief account of my observations might be of interest to the members of this Society. All of the cases were seen in the service of one institution, the Willard Parker Hospital of New York; the conditions, therefore, were the same in all. The series of cases is so large that it should aid us in arriving at a fair estimate of the value of diphtheria antitoxin, as well as of its limitations, when used in hospital practice.

The systematic use of antitoxin was begun in the Willard Parker Hospital at the commencement of the present year, though the serum employed during the month of January was, unfortunately, not strong enough to give the best results. Previous to this year dependence was placed upon the local and constitutional treatment which was in general use elsewhere before the introduction of antitoxin, and the results obtained compared very favorably with those in hospital practice in other cities of this country and Europe. All cases on entrance were irrigated with normal salt solution, and this irrigation was repeated every two hours or even every hour, until the nares were free from discharge or

[1] Read by title and furnished for publication, November 5, 1895.

obstruction and the pharynx clear of membrane. Poultices were employed for the relief of glandular enlargement, and steam inhalations and calomel fumigations were in constant requisition to combat the onset of stenosis of the larynx. When these latter measures proved unavailing, intubation was resorted to, and in a few instances tracheotomy.

The general treatment consisted mainly of the administration of the tincture of the chloride of iron in large and frequent doses. Other tonics were used to meet special indications. Stimulants were not employed as a matter of routine, but, when needed, were given freely, particularly in septic cases.

Under the treatment thus briefly outlined the mortality ranged from 30 to 38 per cent., varying somewhat with the season of the year and the character of different epidemics.

The antitoxin treatment, as I have said, dates from the beginning of the present year. From the 1st of January, 1895, to the 1st of October, 1895, there were admitted to the hospital 593 cases of diphtheria. All of these cases, with the exception of some 10 or 12, were given antitoxin on the day of entrance into the hospital. The local and general treatment of former years was not entirely abandoned, but it has become of secondary consequence. Cases are irrigated on entrance, and the irrigation is repeated from time to time until all membrane has disappeared. Calomel sublimation is still employed, but with much less frequency. The tincture of the chloride of iron is no longer given at all. Patients receive iron, but in smaller doses, and only when it is especially indicated. Intubation and tracheotomy are still required to relieve stenosis of the larynx, but a larger proportion of laryngeal cases recover without operative interference than under former methods of treatment.

Of the 593 cases under consideration, 438 recovered and 155 died, a mortality of 26.14 per cent.

During the same period of nine months in 1894, 469 cases were treated in the hospital, of which 304 recovered and 165

died, a mortality of 35.18 per cent., 9 per cent. greater than that for the present year.

TABLE I.—*Mortality in Willard Parker Hospital during the first nine months of* 1895 *and in corresponding period of* 1894.

1895.	Cases.	Deaths.	Percentage.
First quarter	156	52	33.33
Second quarter . . .	256	75	29.29
Third quarter	181	28	15.47
Totals	593	155	26.14

1894.	Cases.	Deaths.	Percentage.
First quarter	147	53	36.05
Second quarter . . .	214	83	38.78
Third quarter . . .	108	29	26.85
Totals	469	165	35.18

By referring to Table I. it will be seen that the reduction in mortality under the serum treatment began in the first quarter of the year, and became more and more marked as the year progressed. These improved results are probably due to the greater strength of the serum employed, as well as the more efficient dosage during the later months, the natural consequence of longer experience in its administration.

The simple statement that antitoxin lowers the death-rate in diphtheria does not enlighten us very much as to its exact value in different forms and stages of the disease. I have, therefore, analyzed our cases so that we can study them from various standpoints. It is claimed that antitoxin acts as a specific in diphtheria when given on the first or second day of the disease, its value diminishing rapidly after the third day. The critics of the new treatment, on the other hand, assert that the older methods were also capable of controlling the disease if applied at its very beginning.

Table II. will show how far these respective claims hold good in the experience of the Willard Parker Hospital:

TABLE II.—*Deaths according to day of disease upon which treatment was begun.*

1895.

Day upon which treatment was begun.	Cases.		Mortality percentage.	
First day	108		10.09	
Second day	130		25.19	
Third day	116	355	34.19	33.8
Fourth day	87		31.82	
Over four days	152		36.64	
Totals	593		26.14	

1894.

Day upon which treatment was begun.	Cases.		Mortality percentage.	
First day	43		26.67	
Second day	120		33.61	
Third day	111	306	35.40	35.9
Fourth day	74		35.53	
Over four days	121		36.29	
Totals	469		35.18	

According to this table, 108 cases were given antitoxin on the first day of the disease, and 10.09 per cent. died. In 1894, in the pre-antitoxin period, there were 43 cases which came under treatment on the first day, and the mortality was 26.67 per cent., two and one-half times as great as in the cases treated with antitoxin. On comparing the two groups of cases which did not receive treatment until the second day of the disease, we again note a difference in favor of antitoxin. Here, however, the difference ends abruptly, the average death-rate in all cases treated after the second day being only 2 per cent. less in 1895 than in 1894. This table, then, though far from supporting the claim that antitoxin is a specific in diphtheria, apparently proves conclusively that the new treatment, when applied early in the disease, gives much better results than the older methods.

It has been apparent to all those in attendance at the hospital during the present year that fewer patients have presented the symptoms of sepsis than in former years, and that, on the other hand, a much larger proportion have developed broncho-pneumonia at some period during their stay

in the wards. With a view to elucidating these points I have prepared Table III., which gives the causes of death in 1894 and 1895, with the numbers dying of each cause, and the percentage of mortality from such cause in each year:

TABLE III.—*Causes of Death.*[1]

1895.

	Totals.	Percentage.
Broncho-pneumonia	66	53.22
Laryngeal stenosis	17	13.71
Sepsis	13	10.48
Heart failure	11	8.87
Pulmonary œdema	6	4.84
Paralysis	4	3.23
Nephritis	3	2.42
Bronchitis	2	1.61
Pulmonary gangrene	1	0.81
Meningitis	1	0.81
Totals	124	100.00

1894.

	Totals.	Percentage.
Broncho-pneumonia	24	16.90
Laryngeal stenosis	44	30.99
Sepsis	46	32.39
Heart failure	12	8.45
Pulmonary œdema	4	2.82
Paralysis	6	4 23
Nephritis	1	0.70
Bronchitis	2	1.41
Pulmonary gangrene	2	1.41
Meningitis	1	0.70
Totals	142	100.00

A case of diphtheria progressing to a fatal termination presents so many symptoms and complications that it may be very difficult to decide as to the determining cause of death. The above table, however, is compiled from the

[1] This table only includes cases which died in the Willard Parker Hospital. A number of cases in each year developed symptoms of other infectious diseases, such as scarlet fever, measles, or varicella, and were transferred to the Riverside Hospital on North Brother Island.

records of the hospital, which are based upon careful clinical study of each individual case, often supplemented by *post-mortem* examination.

The great mortality from broncho-pneumonia during the present year is the most striking feature of the table, over one-half the deaths being attributed to this complication of diphtheria, whereas only one case in six died of this cause in 1894.

On the other hand, laryngeal stenosis and sepsis, which together caused 63 per cent. of the mortality last year, have proved fatal in less than 25 per cent. of the cases since the introduction of antitoxin. As I have already said, it had been noticed how few of the patients this year developed sepsis, while case after case showed the signs of broncho-pneumonia, particularly when apparently convalescent from the diphtheritic process. This late development of broncho-pneumonia has been one of the most disappointing features of our experience with antitoxin. Patients would be relieved of stenotic symptoms, either with or without intubation, only to die two, three, or even four weeks later of pulmonary complications. It should be said, however, that most of the deaths from broncho-pneumonia occurred in operative cases, and that there have been many more such cases this year than in 1894. An unusually large proportion of the patients entering the hospital had laryngeal symptoms on entrance. Many of these were apparently relieved by antitoxin, and of those who still required operative interference, a larger proportion recovered from the immediate effects of the operation than in former years. Could these patients have been protected from the later invasion of the streptococcus, the number of recoveries after intubation would have been very large.

The following table will show what difference, if any, there was in the duration of stay in the hospital of fatal cases of broncho-pneumonia, laryngeal stenosis, and sepsis in 1895 and 1894:

TABLE IV.—*Duration of stay in hospital of fatal cases of broncho-pneumonia, laryngeal stenosis and sepsis.*

	1895.	1894.
Broncho-pneumonia . .	13.7 days.	2 days.
Laryngeal stenosis . . .	3 "	2 "
Sepsis	3 "	2 "

According to the table, sepsis and laryngeal stenosis, when unrelieved, proved rapidly fatal in both years. The figures for broncho-pneumonia, however, are widely different in the two years. The two weeks' length of stay in the hospital of fatal cases in 1895 illustrates the late development of the disease to which I have referred above.

I have already intimated that, in my opinion, the great reduction in the mortality from laryngeal stenosis was in part due to the administration of antitoxin, but I am in doubt as to whether or not the even greater falling off in the deaths from sepsis is to be credited to the same cause. It is the impression of Dr. Somerset, the resident physician, that very few cases of septic diphtheria entered the hospital during the present year. I have myself noticed in my visits to the wards the rarity of the hopeless hemorrhagic cases which were seen so frequently in preceding years. It will require a careful study of the records to determine whether the lessened mortality from sepsis since the introduction of antitoxin is of any therapeutic significance.

The remaining causes of death in Table III. show a close correspondence in the two years, and call for no remark.

I had hoped to be able to present the exact comparative death-rate for 1894 and 1895 of laryngeal cases, both operated and non-operated, but I shall have to be satisfied for the present with the statement that the total mortality for intubated and tracheotomized cases in the present year is 68 per cent., as compared with 85 per cent. in 1894. It is my impression that the laryngeal cases which escaped operation show an even greater reduction in the death-rate from that for the previous year.

No study of the value of antitoxin in diphtheria would be complete without careful consideration of the age of the patients under treatment. Children under two years of age usually die in spite of all our efforts, whereas older children and adults will often get well without any treatment whatever. I have, therefore, classified our cases according to age, with the percentage mortality for 1895 and 1894:

TABLE V.—*Mortality according to ages of patients.*

1895.

	Cases.	Mortality.
Under 2 years	101	70.59 per cent.
2 to 4 "	129	41.54 "
4 to 6 "	101	19.61 "
6 to 8 "	66	14.93 "
8 to 10 "	30	3.23 "
10 to 12 "	24	4 00 "
12 to 14 "	28	0.00 "
14 to 16 "	19	0.00 "
Above 16 "	95	6.00 "
Totals	593	26.14 "

1894.

	Cases.	Mortality.
Under 2 years	89	67.02 per cent.
2 to 4 "	116	46.28 "
4 to 6 "	87	36.96 "
6 to 8 "	54	23.73 "
8 to 10 "	31	11.11 "
10 to 12 "	12	7.14 "
12 to 14 "	6	0.00 "
14 to 16 "	4	0.00 "
Above 16 "	70	4.00 "
Totals	469	35.18 "

Table V. indicates a lowering of the death-rate by the serum treatment in cases between two and twelve years of age. This accords with the published experience of other hospitals. The unfavorable showing for antitoxin in cases over sixteen years of age is also in agreement with the observations abroad.

The increased percentage of deaths this year among cases under two years of age is, however, surprising and contrary to experience elsewhere. It is true that a large proportion of these cases came to the hospital at an advanced stage of the disease. Many also were laryngeal cases which required intubation or tracheotomy, and further analysis will probably show that broncho-pneumonia played a large part in determining the fatal issue.[1]

The above statistical tables demonstrate fairly, I think, that diphtheria has considerable therapeutic value, even in hospital practice, an admittedly poor field for a demonstration of its curative action. The same tables also point out the limitations of the new remedy to which I referred in the beginning of this paper. A reduction of 9 per cent. in the mortality of diphtheria, or a saving of nine more lives in every hundred patients, is indeed a great gain, but a death-rate of 26 per cent. still remains to combat the claims of antitoxin as a specific in the disease. The chief reason, to my mind, why the experience of the Willard Parker Hospital is not more favorable is that the patients enter the hospital at such an advanced stage of the disease. We have seen in Table II. that only 108 cases of the total number of 593 came under treatment on the first day of the disease. It is my own belief that the great majority of these 108 cases had been ill for two, three, or even more days when they were brought to the hospital. The clinical signs in the throat and the general condition were sufficient evidence of this in many cases. The testimony of parents of the class from which these patients came is but little to be depended upon. Whatever good results we have seen from the serum treatment are accomplished in the face of very great diffi-

[1] Since writing the above I have made further investigation with the following results: 68 of the 101 cases had been sick three days or more, according to the parents, and the average duration of illness of the whole number, previous to entrance into the hospital, was between four and five days.

Over two-thirds (exactly 72) of the cases presented laryngeal symptoms, which necessitated operation in the case of 57. The mortality of the 72 laryngeal cases was 79.2 per cent., of the non-laryngeal cases 51.70 per cent.

Broncho-pneumonia was the cause of death in 39 cases, all but 8 being operated cases.

culties, and I am confident that in private practice among intelligent people the specific character of diphtheria antitoxin will be demonstrated. Welch, in his recent paper, has collected the reports of 663 cases in private practice, with 46 deaths, a percentage of only 6.9, almost 20 per cent. less than the mortality of our 593 hospital cases.

In writing this paper I have proposed to limit myself in the main to simply presenting and arranging the clinical data furnished by the hospital records, from which everyone may draw his own conclusions. In observing a large number of cases of a single disease, all subjected to the same method of treatment, one usually forms a more or less decided opinion, or, at least, impression of the value of that treatment. In the present instance, however, I must admit that I am as yet unable to range myself either among the enthusiastic advocates of diphtheria antitoxin or with those who unqualifiedly condemn it. Perhaps if I touch upon some of the clinical features of diphtheria as modified by the administration of antitoxin in the Willard Parker Hospital, the reasons for my position may become apparent.

Among the favorable results claimed to follow upon the injection of antitoxic serum are: a prompt improvement in the general condition of the patient, a strengthening of the action of the heart, a fall of the temperature, a rapid disappearance or "melting away" of the membrane in the throat, and marked relief of laryngeal stenosis. I have already said that I believed that antitoxin often had a favorable effect upon the laryngeal symptoms, and I am inclined to think that this is especially true of the intubated cases, which seem to do better under antitoxin than without it. On the other hand, I have failed to note any effect, favorable or otherwise, upon either the pulse or the temperature, nor have I ever seen any "melting away" of the membrane which is not also observed in cases which have not received antitoxin. There is a case now in the wards in which the membrane has persisted for three weeks, although antitoxin was given on the third day of the disease.

The general condition has also usually remained unaffected, except as it might be influenced by the relief of laryngeal stenosis referred to above.

Now as to the alleged untoward effects of antitoxin. It has been said to cause nephritis or, at least, albuminuria, to favor post-diphtheritic paralysis, to dissolve the red cells of the blood, and to set up septicæmia in some manner as yet unexplained. In regard to all these clinical phenomena, I can only say that I have failed to observe them, though I have looked for them day by day, particularly during the past eight months. Cases have shown albuminuria as in previous years, and, in the opinion of one of the resident staff, rather more often than formerly, but casts or other evidence of nephritis have been absent. Suppression of the urine occurs, but with not unusual frequency. With the exception of simple regurgitation, due to temporary paresis of the palatal muscles, I should say that post-diphtheritic paralysis has been noteworthy by its absence during the present year. With regard to the destruction of the red cells of the blood, or the occurrence of septicæmia, I have seen nothing which would lead me to attribute either of these morbid processes to the administration of antitoxin rather than to the diphtheritic poison itself. Among the hundreds of cases treated this year in the hospital there is but one in which, in my opinion, antitoxin may have contributed to the fatal termination. In the case in question, a severe one at the outset, a synovial inflammation developed in several joints some ten days after the injection of serum, coincident with an urticarial symptom covering the legs and trunk. The fluid in the joints became purulent, and the signs of broncho-pneumonia were found in the lungs. After a protracted illness the child died, and on autopsy, in addition to the pus in the joints and the pulmonary consolidation, there was marked fatty degeneration of the heart and kidneys. This case would probably have died from the other complications, but we cannot but associate the joint-process with the giving of the antitoxin.

Before closing I wish to say a few words on the secondary

streptococcus infection in diphtheria, with especial reference to the probability that we shall, in the near future, be in possession of a streptococcus antitoxin. We have seen how large a proportion of our cases died of broncho-pneumonia, a complication not due to the Loeffler bacillus, but to a distinct micro-organism, the streptococcus. Could we have successfully antagonized this secondary infection, half of our deaths could have been avoided. This possibility appealed to me this last year with especial force whenever I saw the pulmonary complication develop in convalescents who perhaps were on the point of being sent home as well. I often longed for a recovery hospital, so to speak, to which they might be sent to convalesce free from the infection which must be present in the neighborhood of active cases of diphtheria, especially operated cases. But even this transfer might not save them, for Welch believes that the streptococci which are present in the normal throat are capable of setting up the pulmonary process in an individual already weakened by the effects of the Loeffler bacillus.

It is, therefore, most satisfactory to note the progress that has been made in the production of a streptococcus antitoxin. It has long been believed that there are several varieties of streptococci, each of which is capable of producing distinct pathological effects. It is now claimed, however, by T. J. Bokenham, the late Research Scholar to the British Medical Association, that streptococci observed in connection with different pathological conditions are not distinct botanically from each other. If the culture conditions are changed, the characters of the microbes become altered in many cases. By using for several successive generations the living tissues of rabbits, Bokenham has first obtained erysipelas, then later on pus production, and still later a general infection, very virulent in character, but with no evidence of either erysipelas or pus production. If the series be sufficiently prolonged, the streptococci become of such virulence that a fraction of a drop of the blood of an animal killed by them will set up an infection running a fatal course in a few hours.

At the same time the cultural characteristics have become so changed that a bouillon culture of the microbe no longer resembles one of the original culture. The differences observed between streptococci obtained from different sources are not specific in character, according to Bokenham; they are accidental rather than inherent in the micro-organisms themselves. Therefore, Bokenham is convinced that for the preparation of a streptococcus antitoxin on the same lines as that of diphtheria, the source of the microbe is immaterial; the only necessity is that its virulence should be as great as possible. Unfortunately the streptococcus rapidly loses its virulence in the ordinary culture media. After long experimentation, Bokenham has finally found a satisfactory medium in a mixture of bouillon and asses' serum. He states that he has already succeeded in partially immunizing an ass so that its serum has some protective power. Similar experiments are being carried on in France and in Germany, and there is good ground for hope that we shall soon have an anti-streptococcic serum to supplement the anti-diphtheritic serum in the treatment of diphtheria and its complications.

APPENDIX.

REPORT OF THE COMMITTEE UPON HEALTH RESORTS.

The presentation of the following reports upon some of the health resorts in the United States is the beginning of an attempt to collect reliable data regarding these resorts which will be of service to the physician-at-large. It is proposed to continue this work from year to year as information can be obtained; and all members of the Association are urged to co-operate with the Committee in their exertions to discover health resorts, and obtain authentic facts concerning them. Lists of health resorts and the names of reliable persons in them with whom to communicate are especially desired. In the list of those herewith given no selections have been made, but all from whom we have received a response to our circular with sufficient data are included. Of course, there are many resorts not mentioned in this report owing to the fact that no reliable person in the place was known to the Secretary, or no response to the circular was received, or the place was not called to the Secretary's attention; later, it is hoped that these omissions will all be filled. The circular-letter sent out is here given that it may be seen upon what lines we worked. The aim was to collect such information, meteorological and other, as would enable the physician to select intelligently and with some degree of assurance the climate best adapted to the needs of the patient he was proposing to send away. The especial class of diseases the various resorts were

supposed to be favorable for has not been mentioned designedly, that being left for the physician to determine from the data given.

The Committee is fully aware of the incompleteness and unsatisfactory nature of many of the reports, but the work was new and the difficulty of obtaining the facts not inconsiderable.

The reports of resorts here given are as follows:

California (Southern)—Los Angeles; the Ojai Valley; Pasadena; Redlands; San Diego.

Colorado—Denver; Colorado Springs; Boulder.

Florida—Winter Park; Tampa.

Georgia—Augusta; Marietta; Thomasville.

Kansas—Dodge City.

Minnesota—St. Paul.

New Jersey—Atlantic City; Lakewood.

New Mexico—Albuquerque; Las Cruces; Las Vegas; Santa Fé.

New York—Richfield Springs; Saratoga Springs; Sharon Springs; Saranac Lake.

North Carolina—Hot Springs; Southern Pines; Pinebluff.

Pennsylvania—Kane, McKean Co.; Eagle's Mere; Pocono.

South Carolina—Aiken; Camden; Summerville.

Tennesse—Chattanooga.

Texas—Boerne.

Utah—Salt Lake City.

Bermuda.

Copy of the Circular Sent Out.

1. What is the altitude of your region?

2. What are its general characteristics as to dryness and porosity of soil? The maximum and minimum daily temperature? Relative humidity?

3. Do you ever have high winds or fogs?

4. What proportion of bright, sunny days do you have in the year?

5. Are there first-class hotels and boarding-houses there?

Are there facilities for renting or buying comfortable houses, or for keeping house comfortably at reasonable expense? Give the address of some responsible person from whom particulars in regard to these matters may be obtained, when needed.

6. What attractions are there for out-of-door and indoor life?

7. What particular advantages are claimed for your region as a health resort, and upon what facts and observations are these claims based?

8. State any other facts deemed of importance.

CALIFORNIA.

Los Angeles. Situated in the southwestern part of the State, about twenty miles from the ocean; a city of 75,000 inhabitants; with an elevation of 330 feet.

There are two seasons: rainy and dry, the winter is the season of rain. The soil is generally dry and porous. Some few localities are termed adobe or damp lands, but the dry soil predominates.

The mean yearly maximum temperature, compiled for a period of years, is 87.3°; mean yearly minimum 43.4°. Relatively yearly humidity for a period of years 69 per cent.

During the nights and mornings the winds are generally light land-breezes. In the early afternoon they turn to fresh westerly sea-breezes. There are high winds during the winter, and cyclonic periods during the rainy season. During the dry season there is an occasional "Norther" due to a very high atmospheric pressure north of California, with a relatively low one in the Southern California region. Fogs are more frequent during the change of seasons, when cooler, moist air comes in from the Pacific Ocean.

The average number of clear days is 176; fair days 140; cloudy days 49; making 316 days a year in which a person could be out of doors. Average number of rainy days 42.

There are first class hotels with favorable rates. Many flats have lately been erected with facilities for light house-

keeping at reasonable rates. Comfortable houses can be bought on favorable terms. Many avail themselves of the offers made by firms and individuals of supplying themselves with houses on the instalment plan. The following firms make a specialty of this branch of business: Pirtle Real Estate and Trust Co., 229 West Second Street; Grider & Dow, 109½ South Broadway; Robert McGarvin, 220½ South Spring Street; Clark & Bryan, West Third Street; D. R. Clay, 138 South Spring Street.

There are the indoor attractions usually found in a city of 75,000 inhabitants. The out-of-door attractions are numerous and varied, especially during the winter and spring months. There are floral carnivals in January, March, and April. The seaside resorts offer attractions all the year around. The mountains are in close proximity, and several of the houses are open throughout the year. There are daily excursions into the orange-growing sections during the winter months. The winter climate is such that one can be out of doors from November to May.

The advantages of this region as a health resort are its dry soil, mild temperature, comparatively low humidity, the number of days in which one can be out of doors (316), and the fact that the altitude and climate can be varied by a few hours' journey.

The Ojai Valley, Ventura Co. This valley is situated in the southwestern portion of the State, about fifteen miles from the ocean, reached by stage from San Buenaventura to Nordhoff (sixteen miles). It is approximately six to eight miles long, and from two to four wide. Its altitude is from 900 to 1500 feet.

The soil consists of gravel on the foot-hills and upper slopes, with more or less loam on the level parts and bottoms. Clay subsoil and considerable adobe with some alkali throughout the valley. In most places water runs off quickly or is absorbed rapidly.

Temperature: Winter extremes 80°–26°, ordinary 70°–

40°, summer extremes 110°–50°, ordinary 90°–65°. The atmosphere is said to be extremely dry, and there is no dew. There are occasional high winds with sand-storms. Wind from the north from Mojave desert with considerable electrical disturbance. Fogs are infrequent, and when they occur they burn off by 9 A.M. with a few exceptions.

During the year 1894 there were over 300 bright, sunny days. The average yearly rainfall is sixteen inches.

There are no comfortable accommodations in the valley. Two very primitive hotels. No comfortable houses for rent or sale. There is one well-built boarding-house which has been well spoken of; for particulars one is referred to its owner, Dr. Pierpont, Ojai Valley, Ventura Co., California.

The attractions are all out of doors; horseback-riding through interesting mountain trails and magnificent scenery; rather poor fishing; good hunting, deer, quail, wild doves, rabbits.

The advantages of this valley as a health resort are: The extreme dryness of the air; the few rainy days and absence of dew, so that one can sleep out of doors; protection from coast fogs and winds by a range of mountains; and the slight elevation above sea-level. There are an infinite number of attractive horseback-rides, and one fond of riding could almost live in the saddle. The flora is extensive and offers considerable attraction to lovers of botany. In the spring the fields are a mass of wild flowers. "The valley is one of the most beautiful spots in California," but somewhat difficult of access, and has no good accommodations.

Pasadena. Situated in the southwestern part of the State, of an elevation of 800 to 1000 feet. Within eight miles of Pasadena are various points varying in elevation from 1200 to 3500 feet.

The soil is a sandy loam, a detritus from the mountains, and very porous. The drainage is good.

The mean average temperature for January is 53.9°; July 70.2°; December 58°; August 70°.

The mean maximum and minimum temperature for December: 88° maximum, 37° minimum; for July 90° maximum, 51° minimum.

The relative humidity for July is 60; December 64; September 70.

At Los Angeles, which has about the same temperature range as Pasadena, the mean yearly maximum temperature compiled for a series of years is 87.3°, and the mean yearly minimum 43.4°. The relative yearly humidity for a period of years 69; that of Pasadena is slightly less than this.

There are seldom high winds, "probably on an average three days in the year." From April to September fogs are quite frequent in the early morning, disappearing by eight or nine o'clock. The proportion of bright, sunny days is said to be slightly greater than at Los Angeles, which is as follows: clear days 176, fair 140, cloudy 49, making 316 days in a year in which a person can be out of doors. Average number of rainy days 42.

There are first-class hotels and boarding-houses; the population of the town being 6000. There are all grades of houses for sale and to rent, and one can keep house comfortably and at a reasonable expense. The President of the First National Bank, and of the Pasadena National Bank, and Mr. Robert Strong, Pasadena, Cal., may be consulted for particulars in regard to these matters.

The attractions are chiefly for outdoor life. "The town and the country round about being very attractive and beautiful." There are drives to various points of interest, old missions, orange groves, vineyards, the mountains and numerous cañons, and the mountain railroad to the summit of Echo Mountain.

The peculiar advantages claimed for this region are the mild climate and large number of sunny days, inviting and almost compelling people to live much out of doors. The winters are especially agreeable, and there is seldom extreme heat in summer, and the coldest time in winter is only a trifle

below freezing-point. It is essentially a marine climate, but mild, uniform, and relatively dry.

"It is the most enjoyable all-the-year-round climate," says one writer, "of which I have knowledge, and there are few places with equal social and educational advantages, and where the means of comfortable and even luxurious living are attainable."

Redlands. Redlands is 1350 feet above the sea-level, and is in a valley surrounded by mountains of from 5000 to 10,000 feet in altitude.

It is a town of from 4000 to 5000 inhabitants. The soil is dry, red, deep and porous, in some places stony. For an illustration of the temperature and humidity, see the following table for the month of December, 1893 : the observations were made by Mr. William H. Tisdale, of Redlands :

Date.	Hour.	Dry.	Wet.	R. H.	Hour.	Dry.	Wet.	R. H.	Min.	Max.
1893										
Dec. 4	11.30	...	...	19	4.30	70½	53	27	44	73
5	11.00	78	53	13	4.00	76	58	31	49	80
6	11.00	69	53	32	3.30	72	52	22	50	80
7	11.45	72	56	35	6.00	63	49	33	49	71
8	11.45	76	60	38	4.00	72	60	49	54	76
9	12.50	72	58	42	4.30	70	57	44	52	72
10	12.55	70	56	40	4.45	65	54	48	48	68
11	12.30	68	55	42	4.30	65	55	52	46	68
12	12.45	59½	51	54	......	...	...	...	35	61
13	12.40	61	53	58	......	...	...	...	44	60
14	12.50	60	56	78		rained at 3 or 4 P.M.			47	60
15	12.30	68	54	38	4.40	63	49	33	41	67
16	1.10	67	56	49	4.30	63	53	51	44	67
17	1.45	70	58	48	6.00	61½	49	38	47	70
18	1.00	69	54	35	5.00	63	53	51	46	68
19	1.15	60	54	70	4.45	58	53	72	45	61
20	12.50	60	54	65	5.00	59½	55	75	45	62
21	10.50	58	53	67	......	...	...	...	44	61
22	11.10	55	51	76	5.00	52	50	87	39	54
23	12.30	57	48	50	......	...	...	...	41	57
24	11.50	50	46	74	4.00	44	48	73	44	53
25	1.00	55	50	70	......	...	...	...	39	54
			raining				raining			
26	1.10	45	42	78	......	45	42	78	46	53
		rainy about us								
27	12.30	54	48	64	......	51	47	74	41	53
28	1.00	52	46	63	4.10	53	45	52	38	53
29	12.00	68	50	56	4.50	55	48	59	35	59
30	12.30	61	50	44	4.00	57	47	45	40	60
31	2.00	62	49	41	......	...	...	...	39	61

R. H. = Relative humidity. Dry = Dry thermometer. Wet = Wet thermometer.

There are two seasons, wet and dry; the rainy season, however, means that there may be rain, and does not imply continuous wet weather. The vast majority of the days in that season are sunny and dry, and when it does rain it is generally at night. For six months there is absolutely no rain. It is hot in summer, but owing to the excessive dryness it is said not to be oppressive. At night, even in the hottest weather, one sleeps under blankets, though in the daytime the thermometer may register 110° F.

There are occasional high winds called "Northers," perhaps half a dozen in the year; also occasional fogs which generally disappear before 9 A.M.

For about seven months, from April until the last of October, a cloud is rarely seen. During the rest of the year there is about 12 inches rainfall.

There are two fair hotels, not to be especially recommended; a first-class one is in contemplation. Good board can generally be obtained in private families. Many houses can be rented at reasonable rates. Patients sometimes live in tents the year round, and this plan is recommended as inexpensive and healthy. For particulars one is referred to John P. Fisk, Jr., Redlands, California.

The attractions are those generally found in towns of this size inhabited by people of a high degree of cultivation, and in addition the many outdoor ones which the climate and scenery afford, horseback-riding, bicycling, ranching, orange-growing, etc.

The particular characteristics and advantages of this region are its dry soil, moderate elevation, warm, dry atmosphere, the large proportion of sunny days, and outdoor attractions, all conducing to a life in the open air.

San Diego. Situated in the extreme southwestern portion of the State on the coast. It rises from the sea-level to 225 feet.

The mean maximum and minimum temperature for the

year, from April, 1889, to March, 1890, inclusive, is as follows :

	Temperature.		
	Mean.	Max.	Min.
April, 1889	67.8°	83°	47°
May, "	66.9	80	50
June, "	69.2	72	56
July, "	73.2	84	56
August,"	76.7	89	62
September, 1889	77.6	91	54
October, "	65.0	80	52
November, "	71.6	83	46
December, "	62.5	69	40
January, 1890	51.0	66	35
February, "	54.4	77	38
March. "	55.8	74	41

For the same twelve months the rainfall was as follows: April, 1889, 0.19 (inch); May, 0.03; June, 0.10; July, trace; August, 0.04; September, trace; October, 2.12; November, 0.12; December, 7.71; January, 2.79; February, 1.70; March, 0.31.

The coast fog, about which so much has been written, is most frequent in this region during the months of April and May. The fog-bank usually rolls in about nightfall and disappears a few hours after sunrise. Generally by 9.30 A.M. the coast is entirely free from fog. During these months there may be two or three days on which the fog will be more persistent, and a fine mist may last until 12.30 or 1 P.M., but this only perhaps a half-dozen days out of the year.

"There are 279.9 clear, fair days during which the invalid can remain in the open air from sunrise to sunset. The cloudy days occur during the summer, and serve as a break in the former period of almost constant sunshine."

There are many opportunities for outdoor life and amusements. The surrounding country "abounds in large and small game; the Cuyamaca and San Jacinto Mountains afford deer-hunting, and are desirable localities for camping parties. There is fishing and sailing during all seasons of the year. There are attractive excursions either by rail or boat

into old Mexico. There are also many attractive inland and coast resorts within driving distance of the city. Many of the old missions established throughout California, more than a hundred years ago, are still in existence, either in active occupation or as picturesque ruins."

The accommodations are said to be good, there being first-class hotels and boarding-houses and good facilities for living according to one's means and desire.

Particulars with regard to accommodations, etc., can be obtained from Ross, Dickinson & Co., D Street above Fifth Street, San Diego, Cal.

The county of San Diego presents within its boundaries various altitudes from the sea-level at San Diego to Mount San Jacinto of 11,100 feet elevation, and consequently varying climatic conditions are obtainable. The particular advantages claimed for San Diego itself are those of a warm, equable, marine climate with a majority of clear, fair days. "It is a well-known fact that a thermometrical heat which would be enervating in other localities is stimulating in Southern California."

One is referred to the many articles upon Southern California, especially to "The Climate of Southern California in Relation to Diseases," by William A. Edwards, M.D., San Diego, Cal. (Reprinted from the *Climatologist*, August, 1891.)

COLORADO.

Denver. Situated in the northern half the State just east of the Rocky Mountain Range, 5287 feet above sea-level.

The soil is gravelly and porous, well-drained. There are apt to be wide ranges of temperature, warm days and cool nights. The mean temperature for ten years is 49°, and the mean relative humidity 52. For a careful and exhaustive consideration of the meteorology of Denver, which applies to all this portion of Colorado, one is referred to "Some Meteorological Data," by Samuel A. Fisk, M.D., reprint from the *Boston Medical and Surgical Journal*, September 13, 1894;

and, also, *Rocky Mountain Health Resorts*, by Charles Dennison, M.D., 1880, Houghtin, Mifflin & Co., Boston.

Fogs are almost unknown. The average daily motion of wind is 169 miles, or 85 miles less than the average in Boston. High winds occur occasionally, but only about half as often as in New York, for comparison.

In an average of ten years there were 150 clear days; 164 partly cloudy; and 51 cloudy.

Denver being a large city is well supplied with hotels and boarding-houses at various prices. Houses can be rented furnished or unfurnished. On ranches room and board can be obtained for from $5 to $8 a week. The best plan is for one to go to one of the hotels in town and then obtain particular directions from a physician.

In Denver itself there are such attractions as any large city offers. For purely out-of-door life there is not so much attraction except that of climate, sunshine, and dry air.

The particular advantages of this region which Denver represents as a health resort are: Altitude; dry air; sunshine; freedom from fogs; small amount of precipitation; large number of clear days; dry, porous, sandy soil; small daily movement of wind. These advantages exist approximately in the strip of country about fifty miles wide, extending from Wyoming south along the eastern base of the Rocky Mountains, through Colorado into New Mexico, and then turning southwest into Arizona, taking into account the season of the year. In this belt no particular spot is so much better than another so far as the climatic conditions are concerned.

Colorado Springs. Situated in the eastern central portion of the State, about 75 miles south of Denver, 6000 feet above the level of the sea; a city of from 10,000 to 12,000 inhabitants. It is in close proximity to Cheyenne and Pike's Peak Mountains.

Ten months out of the twelve it is extremely dry. The soil is composed of a coarse gravel to a depth of 60 feet,

with a clay bed sloping to watercourse. It is dry and porous, retaining no moisture, so that irrigation has to be practised.

The daily mean temperature for five years is: Spring 45°; summer 66°; autumn 47°; winter 30°. Year 47°. Maximum temperature 93°; minimum 3°.

The relative humidity is: Spring 46 per cent.; summer 50 per cent.; autumn 54 per cent.; winter 50 per cent. Yearly 50 per cent.

There are no fogs.

During the months of March and April high winds prevail, but only from about 11 A.M. to 3 P.M.; not every day, probably about half of the days in each of these months.

There are 311 average clear days and 54 cloudy or stormy. One authority gives an average of 340 bright, sunshiny days.

There are first-class hotels and boarding-houses. Well-built houses, large and small, for sale or rent. Housekeeping can be done at reasonable expense, and the markets are excellent.

There are two sanitariums, "Bellevue" and "Glockner." For particulars one is referred to George R. Buckman; H. Le B. Willis & Co.; Bennett & Evans; C. L. Lawton; Mathew Kennedy, Colorado Springs, Col.

There are both out and indoor attractions, cañons, grottoes, glens, etc., within five miles, reached by drives or electric cars. Riding, cycling, golfing, polo, skating, tennis, cricket, riding to hounds, walking over the plains and mountains, etc.

In the town there is a country club, casino, library, college, and many opportunities for social intercourse.

The advantages of this place as a health resort are: The dryness, purity, and rarefaction of the air; the dry soil; the large number of sunshiny days; the attractive outdoor life; and the excellent accommodations. "The climate is temperate, as shown by its means, and yet varied, as shown by its range so as to be stimulating and not sedative."

Boulder. Elevation 5500 feet above sea-level. Situated in the heart of the Rocky Mountains, about 25 miles northwest of Denver. Boulder has a population somewhat over

4000 inhabitants, and is the seat of the State University with all its departments. It has an excellent school system, reasonable living, and good society.

The soil is dry and porous, except in areas of clayey soil. Irrigation necessary to raise crops. The proportion of bright, sunny days is very large, there being 360 per year.

From October to March there are occasional high west winds, mainly dry and warm; seldom do any damage. Once or twice a year a fog settles over mountains and plains, but lasting only a few hours.

The accommodations would not be called first-class, but they are ample, and there are facilities for renting or buying comfortable houses. Any information in regard to accommodations can be obtained from Mr. Thomas V. Wilson or Mr. John W. Day, of Boulder, Col.

The out-of-door attractions are those always found in mountainous regions, fine drives, etc.

The particular advantages claimed for this place as a health resort are: Almost constant sunshine; clear, bracing air, which is cool in the shade even in hot weather; and nights that give invigorating sleep and rest. The scenery is grand and inspiring.

(See Vol. X. TRANSACTIONS of this Association.)

FLORIDA.

Winter Park, Orange Co. Although Winter Park is in the midst of the lake region, it has an altitude of over 100 feet above tidewater.

Winter Park is situated on the Peninsula of Florida, in about its narrowest portion, being forty miles west of the Atlantic Ocean and eighty miles east of the Gulf of Mexico. It is about 133 miles south of Jacksonville and 100 miles north of Tampa, and on a direct railroad system from all points in the North.

The air is fine and dry, the country around Winter Park being made up of high pine lands, no marshes or stagnant ponds, but, instead, a chain of beautiful, clear-water lakes.

The temperature of the winter days averages from 60° to 65° during the twenty-four hours. Occasionally there is a frost, and once in a while freezing temperature at night, but none during the day. It rains very seldom during the winter, months, but there are heavy dews night and morning.

The hotel accommodations are first-class, "The Seminole" being one of the most comfortable and convenient houses.

The out-of-door sports are many and varied, there being tennis, croquet, fishing, driving and riding horses, steam and rowboats, etc.

The particular advantages claimed for this region as a health resort are its equable, clear, sunny climate, in which a person can have and enjoy a great deal of out-of-door life, and its freedom from malaria.

Tampa. Elevation 20 feet above sea-level. Tampa is situated in the southwestern part of the Peninsula of Florida, at the terminus of the South Florida Railroad.

It has a porous, sandy soil, generally dry in winter, wet in summer during rainy season.

Mean annual temperature 72° F.; mean winter temperature 62° F.; mean summer temperature 80° F. Relative humidity 85.

For mean maximum and minimum temperatures and relative humidity for every month, see following table:

	Max.	Min.	Average humidity. Per cent.
January	73°	54°	84
February	73	56	84
March	78	58	80
April	82	62	76
May	86	65	76
June	89	70	84
July	89	74	83
August	89	74	81
September	87	72	86
October	82	66	86
November	76	56	84
December	71	54	86

There are sometimes fogs over the bay, but seldom over the city. Occasionally there are high winds in summer, at time of hurricane season.

The proportion of bright, sunny days throughout the year is 65 per cent.

In Tampa can be found first-class hotel and boarding-house accommodations. Refer for information to Messrs. Hendry and Knight, Tampa, Fla.

For out-of-door amusements there are fishing, shooting, driving, rowing, tennis, etc.

The particular advantage claimed for this region as a health resort is its warm climate of great equability.

GEORGIA.

Augusta. Situated in the northeastern part of the State on the Savannah River, which forms the boundary between Georgia and South Carolina.

Augusta proper has an elevation of from 165 to 200 feet. At the Sand Hills, two and a half miles distant, it is 463 feet.

The soil is chiefly white sand with a subsoil of sand in which is mixed some red clay; it is therefore very porous, and the ground never has water standing on it for any length of time after the hardest rains.

The mean temperature for twenty-three years in the city is 64°; maximum 99°; minimum 20°. Relative humidity; 1886, 76; 1887, 73; 1888, 76; 1889, 78; 1890, 76; 1891, 76; 1892, 75; about the same as Aiken, which is located 16 miles from Augusta on the same sand ridge.

High winds and fogs are exceedingly infrequent.

Extending over a period of twenty years, the mean number of fair days for the year was 238; cloudy days 70; snow about two days to every three years.

For accommodations there is the "Bon Air" Hotel affording accommodation for 300 guests, situated on Summerville Heights, the "Sand Hills," two miles from the city of Augusta; it is a first-class hotel. There are also numerous well-kept boarding-houses, facilities for buying residences,

but few houses for rent. For information regarding houses, etc., one is referred to Mr. John Dickey or Alexander & Johnson, real-estate agents, Augusta, Ga.

The out-of-door attractions are: Driving, horseback-riding, hunting, tennis, and boating. The roads are good. The city itself (45,000 inhabitants) affords diversion of various kinds.

The particular advantages claimed for this region are the bracing property of the air, the extreme porosity of the soil, equability of temperature, and absence of sudden atmospheric changes. These, coupled with the comparative lack of humidity in the air and the large number of clear, warm days, make the place one of importance as a health resort for various diseases.

Marietta, Cobb Co. This city covers an area of $1\frac{1}{2}$ by 2 miles, diversified in surface from 1100 to 1200 feet above sea-level.

Marietta is situated in the northwestern part of the State, and has a population of over 2000.

The soil is dry and sandy, very little marsh or moist land. The region is free from malaria.

It is a breezy region, but there are no cyclones or wind-storms, and no foggy weather.

Average temperature of the year $57\frac{2}{3}°$. The variation from this is seldom as much as one degree.

For proportion of bright, sunny days, maximum and minimum temperature, rainfall, etc., see following table for 1888:

Number of sunny days.	Number of rainy or cloudy days.	Av. min. temp. of month.	Av. max. temp. of month.	Extremes of		Rainfall.	Month.
				Max.	Min.		
17	14	36°	49°	72	12	3.10 in.	January.
15	14	40	54	69	10	4.09 "	February.
22	9	39	58	77	19	9.81 "	March.
26	4	52	73	82	42	1.68 "	April.
25	5	57	74	85	41	5.13 "	May.
27	3	68	82	89	60	2.26 "	June.
25	6	66	85	92	64	4.14 "	July.
24	7	68	83	90	50	3.15 "	August.
18	12	60	73	83	40	8.01 "	September.
22	13	49	64	77	37	3.93 "	October.
23	7	44	58	75	26	4.38 "	November.
19	12	34	49	64	18	4.97 "	December.

For accommodations Marietta has two hotels, one of them built only three or four years ago. They are well kept, quiet, and comfortable. There are also various good boarding-houses, where guests can be well provided for. Also a few houses can be rented in and near the city, and some for sale. For information apply to Dr. G. C. Burnap, Marietta, Ga.

The particular advantages claimed for this region as a health resort are its comparatively invigorating climate, dry soil, and temperature, with freedom from malaria.

Thomasville. Elevation 330 feet above sea-level. Thomasville is situated in the southern part of the State near the Florida line.

The soil is sandy and very porous, and dries quickly after a rain. The forests are of pine (the long-leaf Georgia pine).

The following is a consolidated meteorological report for the last year by Prof. L. S. Swain, Volunteer Observer, U. S. Signal Service, at Thomasville.

	Temp.	Relative humidity. Per cent.
January	54.39°	65
February	55.87	62
March	61.61	61
April	67.35	60
May	74.50	65
June	80.02	63
July	81.99	67
August	79.33	72
September	76.12	71
October	68.94	69
November	58.66	67
December	53.40	64
Annual mean	67.78	65

Thomasville's mean winter temperature is 54.55°. For clear and fair days during the year there are generally 268. The prevailing winds are south and northwest.

For accommodations there are four first-class hotels under excellent management, several small hotels, and a number of comfortable boarding-houses. Also houses, furnished or un-

furnished, can be rented or purchased at reasonable rates. Refer to the Hon. H. W. Hopkins, real-estate agent.

The out-of-door amusement are those found in any resort, with the addition of beautiful drives among the pine forests and quail-shooting.

The particular advantages claimed for the region as a health resort, besides its fine climatic advantages, are its location in the midst of the great pine forests; its distance from rivers, river swamps, and large bodies of standing water, and the many clear days in the winter season.

KANSAS.

Dodge City. Elevation 2500 feet. Situated in the southwestern part of the State on the Atkinson, Topeka, and Santa Fé Railroad, in the Arkansas River country, and is easy of access, being twenty-eight hours from Chicago.

From a report of the United States Weather Bureau for seventeen years from 1875, the average temperature was 53° and the average rainfall 21 inches. For 1891 the number of cloudless days was 155; number of partly cloudy days was 155; number of cloudy days was 55; number of days with rain was 80; number of thunder-storms 31.

The prevailing wind is from the south. The average hours of sunshine 8.1. High winds are comparatively common during spring, autumn, and winter. A fog is a rare experience, but some seasons are very wet ones, while others are quite dry.

For accommodations there are no first-class hotels, but there are numerous boarding-houses where people can be made comfortable. Also cottages can be rented at moderate rates. Address for information Rev. E. H. Vaughan, President of Soule College, or H. Whitworth, M.D., Dodge City, Kansas.

For out-of-door attractions there are excellent roads, driving, riding, etc.; there are also churches, schools, and theatres.

The particular advantages claimed for this region as a health resort are its medium altitude; dry, pure air; nearly perpetual sunshine; summer heat rarely oppressive; winters

short and usually mild; the air free from malarial influence; and the water clear and abundant.

MINNESOTA.

St. Paul. Elevation 800 feet. St. Paul is situated in the eastern part of the State, not far from the Mississippi River. Has a population of over 100,000 inhabitants.

The soil is dry and sandy, porous, and dries very quickly after rain.

Fogs are unknown in St. Paul, but high winds are not infrequent.

The region is favored with a great many sunny days, especially in the winter, on an average from 20 to 25 sunny days a month.

For accommodations the hotels in St. Paul and Minneapolis are good; also at the lakes near St. Paul there are fine, large hotels open during the summer season. Houses or apartments can be had at any time of any real-estate agent.

The attractions for outdoor life in winter are skating, ice games, sleighing, etc.; and in summer, fishing, boating, bathing; and in the fall, shooting.

The winters although cold are very dry, and with a large proportion of bright, sunny days; this region is a most desirable one for those with vigor enough to withstand the cold of the winter months.

There is one advantage this region has over many other health resorts, and that is that there is much better opportunity for the patient to find work if necessary.

The water supply of St. Paul is very pure; it is drawn from carefully guarded lakes from 10 to 25 miles from the city.

There are electric street-cars running every five minutes between St. Paul and Minneapolis, which make the midway district, which is several miles in length, a particularly appropriate place for invalids, within easy access of either city and still away from any contaminated atmosphere.

To give an idea of the temperature, with maximum, minimum, and mean temperature for five years, see following table:

		Jan.	Feb	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.	Winter months. Dec. Jan.	Feb.
1889 . . .	Max.	42	50	67	76	84	90	96	91	88	76	56	47	96	Winter of 1889–90	51
	Min.	—10	—25	13	26	33	42	50	49	32	25	— 4	— 4	—25		—22
	Mean	18	9	34	47	55	64	71	70	59	45	29	28	44		18
1890 . . .	Max.	42	51	51	83	86	94	94	92	84	71	59	53	94	Winter of 1890–91	53
	Min.	—22	—12	—16	19	27	51	51	43	31	22	9	— 3	—22		—25
	Mean	9	18	22	47	52	69	71	65	58	46	35	24	43		19
1891 . . .	Max.	46	44	48	83	83	89	84	94	93	74	60	53	94	Winter of 1891–92	53
	Min.	— 2	—25	— 9	13	28	40	47	42	42	29	—13	— 6	—25		—25
	Mean	21	11	23	48	57	65	65	68	67	50	29	30	45		21
1892 . . .	Max.	47	48	56	66	74	90	91	87	85	84	51	33	91	Winter of 1892–93	38
	Min.	—25	—17	— 4	17	30	43	52	46	43	25	0	—16	—25		—27
	Mean	11	23	30	43	51	65	92	70	63	53	30	17	44		11
1893 . . .	Max.	33	38	53	73	79	92	97	95	94	82	73	33	91	Winter of 1893–94	38
	Min.	—26	—27	— 5	21	33	46	55	46	32	17	—10	—16	—25		—27
	Mean	4	11	25	41	54	72	74	69	63	50	33	17	44		16

NEW JERSEY.

Atlantic City. Elevation virtually sea-level. The hotels and cottages are from five to fifteen feet above sea-level. Situated on the southeastern coast of New Jersey upon the central railroad lines, Atlantic City is very accessible, and offers many attractions as a winter and summer resort. It is a regularly laid-out and handsomely built city, with a permanent population of 8000 inhabitants.

The soil is exceptionally dry and porous, being mainly sand. The air is drier than usual at seaside resorts, since all land breezes blow for long distances over a dry sandy region ; the nearness of the Gulf Stream also tempers very considerably the ocean breezes.

The prevailing winds in winter are those from the west and northwest, which are usually dry and bracing. The east and south winds, which often blow for days at a time, are warmer and more humid. Fogs are exceedingly rare. There is no record of the proportion of bright, sunny days, but in the spring and summer sunny weather greatly predominates. Following is a report of Atlantic City from the U. S. Signal Office :

Year.	Temperature.			Wind. Total movement, miles.	Precipitation. Total inches.
	Mean.	Highest.	Lowest.		
1884	52.6	89.9	2.0	75.232	53.70
1885	50.6	91.0	5.0	75.151	38.45
1886	51.5	86.0	—2.0	79.553	44.80
1887	51.8	97.0	7.0	74.819	37.91
1888	50.2	91.0	2.0	88.825	44.14

For accommodations : At no place in the United States (outside the largest cities) can there be found so great a variety of hotels and boarding-houses, including all grades, from ordinary up to the best. Large numbers of furnished cottages are held for rent at from $300 to $1500 for the summer season, or from $25 to $200 per month in the winter and spring

seasons. The markets afford an abundance and variety of food at prices about the same as prevail in New York and Philadelphia.

In regard to accommodations, one is referred to I. G. Adams & Co. and Sternberger Bros., real-estate agents.

For out-of-door attractions there are driving, sailing, fishing, gunning, and pedestrian exercise upon the broad and high boardwalk, which extends for three miles along the beach front. Hot and cold sea-water baths indoors all the year round, and ocean bathing in the summer and autumn.

The particular advantages claimed for Atlantic City as a health resort are its tonic, invigorating sea-air, its dry climate, the absence of malaria, its fine drainage system, and a dry, sandy soil, all of which by reason of its rapid growth make it prominent among health resorts.

Lakewood. Situated in the eastern part of the State on the Central Railroad of New Jersey, two or three hours distant from New York City.

Elevation 40 to 60 feet. There are no statistics of the maximum or minimum daily temperature or relative humidity, but in spite of this fact "the sensation of dampness is far less than that of New York or Boston, or other portions of the Eastern States." In winter the peculiarly disagreeable weather accompanying an east wind in our seaboard cities, and known as "raw," is almost unknown; and in summer, while the weather is frequently warm, it is rarely sultry. The east wind even in winter loses its disagreeable character which makes it a bane to the Bostonian and New Yorker, and in warm weather is the pleasantest wind we have, coming, as it does, with the freshness and coolness of the sea, but deprived of its dampness by the stretch of sand and pine forest over which it has passed. "Its soil varies somewhat in its character, ranging from a light sandy loam to clear beach sand. Its streams, which are sufficient for drainage, have good banks, which they very rarely, if ever, overflow, and there is no wet meadow. There are a few peat bogs, which have been partially utilized

in the cranberry culture, and also some marl beds in the northern portion, and occasionally a cedar swamp, but these features are all of very limited extent. Leaving these out of account, the richest soil is a light, sandy, porous loam, containing about 85 per cent. of silica and only $1\frac{1}{2}$ per cent. of water, while the lightest is almost pure quartz sand, 95 per cent. silica and only 0.6 per cent. water. Extensive pine forests are a prominent feature of this region. They have been in some places cut off or burned, and in some spots are replaced by oak and other deciduous trees, but there are enough left to make it pre-eminently a pine region. One consequence of the sandy nature of the soil is the entire absence of mud. Of course, during a rain or a thaw there is wet sand, but it is no more like mud than the wet sand of a sea-beach, and within a few hours after the cessation of the rain it is dry again. Melting snow does not produce slush, except in rare cases where the snow has immediately followed a freezing rain, as the dry and thirsty soil drinks up the water as fast as the melting of the snow can produce it. I have seen eight inches of snow disappear so completely in twenty-four hours that one could walk out, "across lots," with thin shoes without moistening the feet. Owing to the coarseness of the sand, there is no dust, except a slight amount in very dry weather where the roads have been covered with clay or gravel."

Fogs are very rare; and the winds are about as in other parts of the Atlantic States. There are no definite statistics as to the proportion of bright, sunny days in the year, but they are rather more than in most parts of the Atlantic States.

Accommodations: There are three large first-class hotels, and two smaller but good ones. Many excellent boarding-houses. Good facilities for renting or buying. The prices are about as at other health resorts; the place is popular and consequently prices are not low. For information apply to A. M. Bradshaw, Esq., Lakewood, N. J.

The attractions are excellent drives and walks, good roads for cycling, rowboats on the lake, a golf club open to tempo-

rary subscribers or introduction of a member, tennis-courts at the hotels, frequent concerts, dramatic entertainments, etc., at the hotels.

This region offers to those who cannot avail themselves of the high-altitude treatment, or on account of their condition it is contra-indicated, a refuge with the very decided advantages of an exceedingly dry, porous soil, the environment of pine forest, good accommodation and medical service, and easy accessibility from the great centres of population. "It is very exceptional for a patient with bronchial or pulmonary diseases not to derive some benefit, greater or less, from the change, and in many cases the benefit has seemed remarkable."

NEW MEXICO.

Albuquerque, Bernalillo Co. Elevation 5026 feet above sea-level. Situated in Bernalillo Co., in the north-central part of the State; population about 5000. The town rests upon a dry, sandy soil; relative humidity about the same as Colorado.

Rainfall for 1893, 7.42 inches; rainfall for 1894, 5.14 inches; rainfall for January, 1895, 1.14 inches. Dew is rarely seen, hoar-frost occasionally in the coldest weather.

Temperature: 1892. Maximum temperature 97° F.; minimum 15°. 1893. Maximum temperature 98°; minimum 11°; mean 56.2°. 1894. Maximum temperature 95°; minimum 0°; mean 54.5° 1894. Mean range 28.4°; minimum for five months, March to July, 32°.

Fogs are of very rare occurrence; high winds are more frequent, especially in the spring and early summer months.

For proportion of bright, sunny, clear days, there were for 1893, clear days 193, partly cloudy 147; cloudy 15; for 1894, clear days 211, partly cloudy 129, cloudy 25. Percentage of clear days in 1893, 53; percentage of clear days in 1894, 58. Calling partly cloudy days as one-half sunshine, percentage of sunshine in 1893, 73; percentage of sunshine in 1894, 76.

For accommodations there are good hotels and boarding-

houses, also facilities for housekeeping. Expenses are higher here than in Eastern towns of the same size, and of necessity. Most articles of food are brought long distances by rail. Legal rate of interest (12 per cent.) makes rentals high. While many manage to live with a good degree of economy, no one should come expecting to find the comforts of home unless he is prepared to meet considerable expense. Rev. N. G. Alger is well informed in regard to accommodations.

For out-of-door life there are beautiful walks and drives, on horseback, burroback, or in carriages, with pleasant river and mountain views. Lawn-tennis and games of that nature.

The particular advantages claimed for this region as a health resort are the dryness and equability of the climate and temperature.

Las Cruces. Situated in the southern portion of the State on the line of the Atchison, Topeka, and Santa Fé Railroad. Elevation, 3800 feet.

A warm and dry climate with a sandy soil.

From July, 1893, to July, 1894, there were twenty cloudy days. There is no fog, and the average movement of the wind is 5½ miles an hour. The extreme range of temperature is from 2° to 106° F. The average is said to be about 62°.

The particular advantages claimed for this place as a health resort are: "The very mild winter climate; the absence of severe changes, dryness of the air, and sunny days."

The attractions are "shooting," good drives, and Mexican curiosities.

Address for boarding-houses, etc., Messrs. F. C. Baker, J. K. Livingston, J. R. Schmidt, R. C. Halton.

Las Vegas. Elevation 6500 feet. (Many of the popular resorts in the mountains near by are from 7200 to 9000 feet in altitude.)

Situated in the northern part of the State on the line of the Atchison, Topeka, and Santa Fé Railroad.

The climate is a stimulating, dry mountain one, and the

soil constantly dry with natural drainage. The mean annual temperature is 41°, and the relative humidity about 45, being very low in winter and spring—as low as 20 in March. The mean maximum and minimum temperatures for the years 1893 and 1894 are given as follows:

1893.	*Max.*	*Min.*	1894.	*Max.*	*Min.*
January	52°	19°	January	46°	20°
February	46	25	February	41	15
March	54	27	March	55	28
April	64	36	April	66	35
May	71	44	May	73	44
June	84	52	June	78	49
July	83	56	July	81	54
August	76	55	August	77	54
September	72	47	September	72	45
October	65	32	October	67	38
November	54	26	November	62	28
December	51	23	December	48	22

The annual rainfall for the five years from 1888 to 1894, inclusive, was 16.77 inches, more than half falling in July, August, and September.

There are high winds in the cooler months about two-thirds of the year, generally the most prevalent the first four months of the year. There are no fogs.

For the years 1892, 1893, 1894 there were 280 clear days, 60 partly cloudy, and 25 cloudy per year. Many years' statistics at Fort Union nearby gave August the prominence as a cloudy month.

The facilities for boarding and lodging are said to be fair. At the Hot Springs, five miles distant, is the Montezuma Hotel, a fine one, at present closed, but with a prospect of reopening soon. There is no first-class hotel in the town itself, and very few boarding-houses. Most visitors lodge in one house and eat in another. Unfurnished rooms are to be had at from $10 to $20 a month, and board is from $6 to $7 per week. Furnished houses are at times to be had to rent, and unfurnished ones more often. It is difficult to obtain servants. Adin H. Whitmore, Mayor of East Las Vegas, can furnish definite information as to accommodations.

East Las Vegas is a town of 2500 inhabitants, and has good schools, churches, an opera house, and a small hospital; there are street cars, city water, electric lights, etc. The out-of-door attractions are riding, and driving, and in winter skating.

The particular advantages claimed for this place as a health resort are those of an elevated, dry, mountain climate. "The summers in Las Vegas are simply divine, never hot or stifling, and the nights cool." The chief disadvantage is the wind and dust in winter. The climate is suited for such cases of phthisis as are proper for high-altitude treatment.

Santa Fé. Santa Fé is a city of about 7000 inhabitants, situated in the northern part of the State, and of an altitude of 7000 feet.

The soil is porous, and the climate mild and equable as shown by the following data:

ANNUAL MEAN FOR THE YEARS 1885–92.

1885	47.7°	1889	49.8°
1886	47.6	1890	50.4
1887	49.0	1891	47.3
1888	48.4	1892	49.1

MONTHLY MEAN.

January	28.3°	July	63.0°
February	31.7	August	65.9
March	39.1	September	59.0
April	45.5	October	49.4
May	56.0	November	36.7
June	65.4	December	40.2

For 1892 the average temperature was 49.1°; the average relative humidity 43; average velocity of wind, miles per hour, 07.7; total rainfall 11.62; number of cloudless days 248; number of fair days 97; number of cloudy days 29.

From January 1, 1893, to August 15, 1893, the number of cloudless days was 145; number of fair or partly cloudy 64; number of cloudy days 19.

There are no fogs. The worst winds are from March 15th to April 15th, when they are high and steady, but usually of short duration.

For accommodations, houses, etc., one is referred to Col. Max Frost, Santa Fé, New Mexico. There are two hotels with low weekly rates for permanent guests. The "St. Vincent Sanitarium" is also very well spoken of.

There is an abundance of hunting and fishing in the mountains near-by. Fruit-farming, stock-raising, opportunities for out-of-door games. Various social entertainments and amusements, concerts, classes, and clubs for the study of the Spanish language.

The characteristics of this region are its porous soil, dry, rarefied air, large amount of sunshine, slight variation of temperature only between the extremes of heat and cold, and the invigorating quality of the air. "It is a land of sunshine" and "extremes are unknown."

NEW YORK.

Richfield Springs. Situated in the eastern central portion of the State, south of Utica; 1800 feet above sea-level.

The soil is gravel and loam, and becomes quickly dry after showers.

The average temperature during the summer is about 76°.

The prevailing winds in summer are westerly and southwesterly. The town is protected from high winds by hills of from 300 to 800 feet high surrounding it on all sides except the south, the town being situated at the head of a valley. Fogs occur very rarely in the early morning.

For the most part the days are bright and clear. There are rather frequent thunder-showers.

There are many first-class boarding-houses and hotels, varying in price from $6 per week to $4 a day. Also facilities for renting and buying comfortable houses. The expense of housekeeping is reasonable. For particulars apply to Melvin Fuller, Richfield Springs, N. Y.

There are excellent roads for driving, riding, and cycling, golf, tennis, boating and fishing on Canadarago Lake three-quarters of a mile from the village.

This is a summer resort, and the particular advantages are

the sulphur springs and the pure, invigorating climate. There is a large and perfectly equipped bathing establishment for the scientific administration of these waters, under the personal direction of a competent physician. The waters are especially applicable to the treatment of rheumatism, gout, and allied conditions.

Saratoga Springs. Elevation, the highest point above tide-water within the village-limits is 418 feet. Situated in the east-central part of the State in a pleasant sandy valley, it has naturally a very dry soil. Temperature monthly normals as follows: January, 21°; February, 22°; March, 30°; April, 44°; May, 58°; June, 68°; July, 72°; August, 70°; September, 62°; October, 50°; November, 37°; December, 25°.

The mean daily range at Saratoga during the year is about 20°; the average daily maximum temperature is found by adding half the daily range to the monthly normals, the minimum by subtracting the same.

No observations of humidity in Saratoga have been kept, but it is claimed that Saratoga, from a climatic standpoint, is in the Champlain and not in the Hudson region, and the former is well known as the dryest section of the State.

High winds are almost unknown in Saratoga, and fogs are very infrequent, sometimes a few in the early spring. No record of bright, sunny days has been kept, but there is a large per cent. in favor of this place over any other section of the State.

Saratoga is too well known to say anything about its hotels or boarding-houses; they are *first-class*. There are many fine houses to rent, also ones of moderate price; the expense of keeping house is about the same as elsewhere. Address in regard to accommodations R. F. Knapp and Lester Bros., Arcade Building, Saratoga Springs.

For out-of-door attractions there are beautiful drives (with excellent roads), parks with music, hops in the season, etc. The town has all modern conveniences, excellent water, the

streets are macadamized, sidewalks, and plenty of shade-trees. Electric road to lake, four miles distant, and to all outlying springs; the best of schools, both public and private, and churches of all the leading denominations.

The particular advantages claimed for this region as a health resort are its dry atmosphere, with cool nights and warm days in summer; its early spring, due to the sandy soil, its freedom from winds and fogs, and its many and varied mineral springs.

Sharon Springs. Situated in the east-central portion of New York, in a valley 1200 feet above the level of the sea.

The soil is of a limestone formation, and there is natural drainage. The air is pure, bracing, and dry. High winds are rare and fogs almost unknown. During the summer a large proportion of the days are bright and sunny.

There are a number of first-class hotels and boarding-houses from $7 to $21 per week. There are a few houses to rent for housekeeping, and a number of furnished cottages connected with the hotels. One is referred to John H. Gardner & Son, Sharon Springs, N. Y., for information upon this subject.

The attractions are riding, driving, various outdoor sports, and the amusements common in a summer community.

The sulphur springs and baths are the especial attractions of this place, together with a pleasant summer climate, free from malaria. It is a summer-resort only. The bathing-establishments are large and complete, and the methods of using the sulphur water are the same as at Aix les Bains, Marlioz, and Allenard. A competent physician is in constant attendance to direct the application of the waters. They are especially applicable to rheumatism, gout, skin and nervous diseases, nasal catarrh, and other affections of the upper respiratory tract.

Saranac Lake. Situated in the Adirondack Mountains in the northeastern part of the State, from 1540 to 1750 feet above sea-level.

The soil is sandy and very porous and in twenty-four hours after a heavy rain the roads become dusty. During the summer there are frequent rains and in consequence there is more or less moisture in the air. For four months in the winter it is very dry and cold.

The annual mean temperature is 42.5° F.; highest monthly mean 66.3°, in July; lowest monthly mean 13.4°, in February. Maximum 91°, minimum 32°, annual range 123°, mean daily range 23°.

Rainfall: Number of days in which 0.01 or more inches fell 125; total for year 34.71. Greatest monthly fall 5.06 in June. Least monthly 0.75 in April. Total snowfall 85.5.

Fogs are very rare. In summer there are sudden severe winds. In winter there is an average of about one windy day in ten.

About three days in every five are sunny. Number of clear days 132; number of partly cloudy 104; number of cloudy 129.

Good hotels open during the summer abound. In winter the hotels in the village, including the "Ampersand," remain open. There are a number of good boarding-houses at various prices. Cottages can be bought or rented, but are somewhat expensive: unfurnished $30 to $70 a month; furnished $75 to $150. Suites of two to four rooms can be rented very much more cheaply. One is referred to J. Reginald Foster, Saranac Lake, who will answer inquiries regarding these matters.

There are fishing and hunting in the season, fair roads for driving, sleighing for three months every year; a library in the town.

The advantages of this region as a health resort are a dry soil, pure air, with a considerable amount of sunshine; cold, dry, stimulating winter climate, and ease of accessibility from the larger cities of the east—eleven hours from New York.

The Adirondack Cottage Sanitarium is 1½ miles from the village of Saranac Lake, and accommodates 80 patients. It is built on the cottage plan, each cottage holding from 2 to 5

patients. Here is a large, open-air, billiard, pool, and recreation hall. Only patients in the incipient stages of tuberculosis are received, or when in the opinion of the examining physician the disease may be arrested in more advanced cases. The charges are $5 a week; persons who can pay higher are not received. About 25 per cent. of all cases are discharged "apparently cured;" in 25 per cent. the disease is arrested; in 25 per cent. improved; and in 25 per cent. unimproved. It is open the whole year. Patients do better and feel better during the winter months.

North Carolina.

Hot Springs. Elevation 1325 feet above sea-level. Situated in the western part of the State.

It has a dry, porous soil, so much so that rain disappears almost immediately after falling. The diurnal ranges of the thermometer are very small, the average humidity is 66 per cent. There are very seldom high winds, and fogs are only occasionally seen on the tops of the mountains.

The meteorological record kept for the United States Signal Service shows that out of 153 days (from July 1st to December 1st), 108 days were clear, 32 fair, 4 cloudy, and 9 rainy, permitting the most confirmed invalid to enjoy being out of doors all, or nearly all, day, for 140 days, and being confined to the house but 13 days in five months. The same record shows for the following winter that of the 182 days of the six months from November to April, inclusive, 150 days were clear and fair, and 32 days cloudy or rainy, and that the average mean temperature during these months was 46.9° and the humidity 70.7.

For accommodations there are one first-class hotel, two comfortable boarding-houses, and a good many simple wooden cottages. The living is inexpensive. Dr. Dorland and Prof. Smith (teachers at Dorland Institute), also Mrs. Swaine or Mr. Shaw, all of Hot Springs, can give information in regard to boarding accommodations.

For out-of-door sports there are drives, and good oppor-

tunities for climbing, tennis, swimming-pool in summer, mineral baths, massage, etc.

The particular advantages claimed for this region as a health resort are its dry atmosphere, the small daily ranges of temperature, and the absence of fogs and winds. The clemency of the weather enabling and inducing patients to spend the greater part of the day out of doors is also a great attraction in favor of the healthfulness of this region.

Southern Pines and Pinebluff. Situated seventy-five miles southwest of Raleigh, they are in the heart of the pine-belt of North Carolina. The former is a well-established resort. The soil is exceedingly porous, the air pure and invigorating, much warmer than points at the same latitude to the westward and sufficiently removed from the coast to avoid all dampness. Southern Pines has a large and well-conducted hotel. Pinebluff is a new resort and affords accommodations at more reasonable rates.

Simple cottages have been erected at Pinebluff which may be rented with or without board. They are neatly furnished and will be rented at $50 for the season or $20 per month. Excellent table-board can be had not exceeding $5 to $6 per week, or for a small additional charge meals will be sent to cottages. This plan, where there are two or more persons coming together, offers many advantages, combining home comforts, quietness, absolute rest where necessary, and cheapness of living. Reached by Seaboard Air Line Railroad. For additional information address J. T. Patrick, Pinebluff, N. C.

See also Vol. III. of the TRANSACTIONS of this Association.

PENNSYLVANIA.

Kane, McKean Co. Situated in northern Pennsylvania, in the highland region, at an elevation of 2000 feet. It is dryer than any other part of Pennsylvania, and is on the watershed between the Ohio and Susquehanna River systems.

The surface of the country is diversified, rough and mountainous in many places in the extreme, and in most places

still covered with forests to the top of the mountain. The forests consist largely of hemlock, with here and there some pine, while there are many ridges timbered with beech, birch, and maple. The occupation of the inhabitants is varied, consisting in a limited degree of agricultural pursuits, and to a large extent of manufacturing and the production of petroleum. Population 4000.

The soil is sandy and absorbent.

Mean Max. Temperature.		*Mean Min. Temperature.*	
June	75°	June	52°
July	80	July	55
August	77	August	53
September	73	September	52

The humidity is low. Sometimes the winds are high, but there are no fogs. There are no valleys. The proportion of clear and cloudy days is as follows:

1894.	*Clear.*	*Partly Cloudy.*	*Cloudy.*
April	12	7	11
May	10	7	14
June	16	10	4
July	19	8	4
August	17	12	2
September	9	13	8

There is one good hotel open all the year, besides a few houses for rent. For particulars address C. H. Kemp, Thomson House, Kane. The attractions are the ordinary ones of a mountain region.

The particular advantages of this region are its easy accessibility, moderate elevation, stimulating climate, dry and therefore permeable soil, extensive forests, a clear sky, and ample opportunities for out-of-door life.

Eagle's Mere, Sullivan Co. An agreeable, cool, summer resort; elevation 2060 feet. Boating and bathing in the lake are the chief attractions. There are four hotels, and good cottages can be rented. Address Captain E. S. Chase.

Mount Pocono and Pocono Summit, Monroe Co. Elevation 1700 to 2000 feet. There is great dryness of air and soil, and for four months in the year there is an agreeable climate.

The mountain-side is covered with a scant forest and a profusion of laurel and rhododendrons. While the forests have been devastated in many sections, large tracts still exist composed of white and yellow pine, hemlock, spruce, and balsam. On the Naomi Pines property, 4½ miles west of Pocono Summit Station, there is at present a tract of about one hundred acres of white pine—the primitive forest.

As proof of the dryness of the atmosphere, it is stated that, as a rule, the grass will be entirely free from dew on summer nights as late as eleven o'clock.

See also Vol. III. of the TRANSACTIONS of this Association.

TEMPERATURE AT NAOMI PINES, POCONO SUMMIT, PA.
Recorded by W. A. CAREY, M.D.

Date.	July, 1894.			August, 1894.		
	8 A.M.	12 M.	8 P.M.	8 A.M.	12 M.	8 P.M.
1	...	...	...	66°	78°	64°
2	...	...	...	64	70	64
3	...	...	...	66	72	66
4	70°	74°	58°	56	60	56
5	56	70	58	54	64	56
6	60	64	58	58	70	60
7	58	60	52	60	74	62
8	50	56	50	68	78	64
9	50	56	46	64	70	62
10	56	64	60	60	66	54
11	64	72	62	64	70	54
12	66	72	68	54	52	48
13	72	80	70	56	68	60
14	72	74	66	60	70	58
15	64	72	64	62	78	60
16	66	72	64	56	64	54
17	68	74	68	50	68	50
18	68	80	68	60	72	64
19	68	82	72	68	72	64
20	68	84	74	58	62	56
21	72	78	74	48	60	50
22	60	62	80	48	66	54
23	60	66	60	58	78	62
24	60	64	60	60	80	64
25	66	78	68	60	78	68
26	68	80	72	60	72	64
27	70	84	70	54	70	60
28	72	86	72	60	74	60
29	72	84	62	52	72	54
30	66	74	64	60	66	56
31	68	80	67	50	64	50
Average	64°	72°	57°	58.5°	68.3°	58. 6°

July. 23 perfectly clear days; prevailing winds northwest.
August. 17 perfectly clear days; 2 rainy.
9 partly clear days; 3 showery days.

Mount Pocono is three hours by rail from New York, and five hours from Philadelphia. Address the "Wiscassett," Pocono Mountain House, or "Swiftwater."

South Carolina.

Aiken. Elevation 565 feet. Situated in the southwestern part of the State, on the South Carolina and Georgia Railroad, 120 miles from Charleston and 17 miles from Augusta, south, being only twenty-two and a half hours from New York. Ga. Aiken is within easy access from all points north and

The climate is temperate during the season; the prevailing wind is from the southwest. Aiken is to be classed in the moderately dry climates; sunshine is one of its most important factors. From November 1st to May 1st the average number of rainy and cloudy days is 27; all the rest clear and fair. There are occasional fogs in the fall in early morning, but they are gone by 9 A.M. There are also high winds occasionally.

Meterological Record taken at Aiken, S. C.

By a Voluntary Observer, United States Signal Service.

Lat. 33° 32′; long. 81° 34′; altitude, 565 feet; period of observation, 1888 to 1894.

	Mean temperature for months at hours of			Mean temperature of months (7+2+9+9)÷4.	Mean temperature from max. and min.	Mean barometer.	Direction of prevailing wind.	Mean relative humidity.	Average number of clear days.	Average number of rainy and cloudy days.	Mean rainfall in inches.
	7 A.M.	2 P.M.	9 P.M.								
Nov.	48.33	61.47	52.69	53.54	55.30	29.623	S.W.	59.65	27	3	1.33
Dec.	42.48	57.05	48.02	48.89	50.71	29.540	W.& S.W.	58.58	26	5	2.65
Jan.	41.28	52.67	44.54	45.75	47.87	29.615	N.E.	63.17	23	8	4.68
Feb.	44.41	56.84	49.92	50.27	52.01	29.622	S.W.	60.31	24	4	4.35
Mar.	49.55	59.80	53.36	54.02	52.03	29.494	S.W.	57.90	26	5	6.07
Apr.	57.23	71.78	53.26	58.88	64.33	29.547	S.W.	52.78	29	2	2.33
Mean	......	......	......	51.89	53.70	29.573	....	58.73			

These observations were taken with U. S. Signal Service instruments, and according to their regulations, thermometers being exposed on north side of the house, in the shade, and protected from reflected sun rays.

The accommodations of Aiken are excellent; the Highland Park Hotel is first-class, well constructed and well equipped,

and accommodates 300 guests. The boarding-houses are numerous, and superior board can be obtained in them from $8 to $15 per week. There are always plenty of houses to rent, all furnished. When people do not wish a whole house they can rent two or three rooms with kitchen.

There are good schools and churches, and it is proposed soon to have a sanitarium arranged for diseases of the lungs.

For out-of-door attractions there are fine golf and polo grounds, race-track, fox-hunting, quail-shooting, tennis, fine drives, etc.

The particular advantages claimed for this place as a health resort are the dryness of atmosphere, with a great amount of sunshine and clear days; there is no dust, and the air is laden with balsamic odors from the numerous forests of pines surrounding the town.

For further information upon the effects of the climate, particularly in the treatment of pulmonary diseases, one is referred to papers by the late W. H. Geddings, M.D., in the *Medical Record*, New York, November 15, 1879, October 30 and November 6, 1880, October 3 and 10, 1885, and December 22, 1888, and in Vol. III. of the TRANSACTIONS of this Association.

Camden. Elevation between 150 and 200 feet above sea-level. Situated in the north-central part of the State, about thirty miles from Columbia. Camden is easy of access, being only twenty hours from New York.

It is in the piney-wood, sandhill region of the State, and has nearly 3000 inhabitants. The soil is very dry and porous. Immediately after a heavy shower and for some time after a continued rain the roads are not wet, the water soaking so quickly into the sandy soil.

Temperature for thirty-one years: Mean spring temperature 61.90°; summer, 79.32°; autumn, 62.26°; winter, 45.16°. Average annual rainfall for twenty years, 42.22 inches. The prevailing winds are south and southwest. In February and

March there are some high winds, but generally the air is remarkably dry, soft, and balmy.

Camden has a sunny climate; the exact number of sunny, clear days not obtainable.

The accommodations of Camden are excellent, there being a number of boarding-houses, besides "The Hobkirk Inn," which is a well-kept house. For renting or buying houses information can be obtained from W. E. Johnson, Esq., and P. H. Nelson, Esq.

For out-of-door attractions there are fox, quail, and deer-hunting, tennis, etc.

The particular advantages claimed for this region as a health resort are its dry, balmy, bracing air, with conditions favorable for continual out-of-door life, and the depth of sandy soil, which insures good drainage.

Summerville. Elevation 75 feet above sea-level. Situated in the southeastern part of the State, twenty-two miles from Charleston. Summerville is easy of access, being connected by the South Carolina Railroad from Charleston, Augusta, and Columbia, and being but twenty-four hours from New York. There are about 3000 inhabitants.

It has a sandy soil, overlying a clay subsoil; its surface is slightly hilly, and there is no stagnant water. The streets are dry in a few hours after the heaviest rainfall. The average temperature for sixteen years has been 71.6° maximum and 58.9° minimum. Its mean rainfall for nineteen years was 56.76 inches. There are never high winds, except in the case of a cyclone.

The proportion of bright, sunny days is said to be over nine-tenths.

For accommodations there are two first-class hotels, one "The Pine Forest Inn," and plenty of boarding-houses. The postmaster of Summerville, Capt. James O. Tadd, will furnish any information in regard to accommodations.

For out-of-door sports there are hunting, fishing, and visits to interesting points in the vicinity, tennis, etc.

The particular advantages claimed for this region as a health resort are its dry soil and pine forests, its equable temperature, and freedom from the enervating heat peculiar to points further south. It is also the only place of the kind where the pines are protected by law, and where they are thickly scattered throughout the town instead of bordering upon it.

TENNESSEE.

Chattanooga. Elevation 762 feet. The surrounding mountains are higher in elevation, such as Missionary Ridge, 1320 feet, and Lookout Mountain, 2160 feet, both of which points are easy of access.

Chattanooga has about 50,000 inhabitants, and is situated on the southern bank of the Tennessee River, on the extreme southeastern border of the State.

The scenery in and around Chattanooga is ever varying and beautiful, the air is exhilarating and invigorating, and of great purity. The soil is dry and loamy; everywhere excellent drainage. Maximum daily temperature 101°, minimum 7° below zero.

There are occasional winds and fogs, but the city is so surrounded with mountains that it is greatly shielded in this way.

The accommodations of Chattanooga are excellent. One of the fine hotels of the South is "Lookout Inn," on Lookout Mountain, open all the year. There are also numerous boarding-houses and rooms in private houses. Dr. W. A. Applegate will be glad to furnish any information in regard to accommodations.

The relative average annual humidity is 71 per cent., and the average annual number of clear days is 117, fair 147, and cloudy 101.

For out-of-door attractions there are beautiful drives, built by the government, to the Battlefield Park at Chickamauga, also fine country roads good for bicycle-riding, etc. Good boating and fishing on the Tennessee River.

The particular advantages claimed for Chattanooga are the

temperate climate—there are no very sudden severe changes; the large number of sunny days in which the invalid can remain out of doors, and the invigorating effect of the air.

Texas.

Boerne. Boerne is situated in southwestern Texas, thirty miles northwest of the city of San Antonio, on the San Antonio and Arkansas Pass Railroad. It has a population of 800, and has an average altitude of 1550 feet.

The soil is composed of gravel and sand with occasional streaks of adobe, and a substratum of porous limestone. The drainage is good, both on account of the slope and the porous character of the soil.

The average temperature at noon for spring is 73.8°; summer, 85.3°; autumn, 69.5°; winter, 62.7°. The maximum daily temperature is 68.74°; the minimum daily temperature is 59.71°.

The mean relative humidity is from 72 to 66, and the annual rainfall about 30 inches. The mean daily barometer 28.44, not reduced to sea-level. Occasionally during the winter months there is a sudden fall in temperature during the prevalence of a "Norther;" this fall depends on the velocity of the wind and ranges from 5° to 25°, and lasts from a few hours to three or four days.

The windfall is light, from the south and southeast, the velocity ranging from 4 to 7 miles an hour, and occasionally increasing from 14 to 25 miles during a "Norther." There are a few light morning fogs in the late autumn and winter, not exceeding a total of eight days in the year. The average number of sunny days is 285, and of cloudy 80. The number of days in which there is more or less sunshine, and in which an invalid can be out of doors, is 355.

There are no first-class hotels, but a number of fairly good ones. There are good boarding-houses both in the town and a few miles from it. Many ranches in the neighborhood also take boarders. The price of board and room at the hotels and boarding-houses is from $20 to $40 a month. Houses in the

town can nearly always be rented for from $5 to $20 per month, the latter price being for plainly furnished houses of four to five rooms. Good facilities exist for housekeeping, and living is cheap. Particulars can be obtained from Mr. H. Graham, Boerne, Texas.

The attractions are all out-of-doors, riding, driving, hunting, and fishing. San Antonio, the largest city in the State, is within an hour's ride by rail.

This region affords a dry, moderately warm, equable climate, a dry soil with good natural drainage, a large number of bright, sunny days, and freedom from dust-storms. There are very few days in the year unsuitable for out-of-door exercise. The altitude (from 1500 to 1670 feet) insures pure and bracing air.

UTAH.

Salt Lake City. Altitude 3500 to 6000 feet with higher points conveniently accessible. The altitude of Salt Lake City is 4348 feet above sea-level.

For average temperature, relative humidity, number of clear days, etc., see following table :

	Aver'ge mean temp.	Aver'ge max. temp	Aver'ge min. temp.	Relative humidity per cent.	Average number clear and fair days.	Prevailing winds.	Rain (inches).
January . .	28.7°F.	48.8°F.	—6.1°F.	59.4	19.8	S.E.	1.33
February . .	33.0	50.9	—3.0	57.2	18.3	S.E.	1.37
March . .	41.7	63.9	21.6	49.1	20.5	S.E.	2.01
April . . .	48.7	71.7	29.7	46.6	20.2	N.W.	2.44
May . . .	57.2	83.3	35.6	40.6	23.7	N.W.	2.14
June . . .	67.7	94.2	46.9	32.6	26.9	N.W.	0.67
July . . .	75.2	95.0	51.6	30.1	28.3	N.W.	0.59
August . .	74.1	95.0	49.3	31.5	28.1	S.E.	0.84
September . .	64.0	87.5	53.1	32.8	27.3	N.W.	0.85
October . .	51.1	75.8	28.1	43.0	24.4	N.W.	1.81
November . .	39.0	61.4	18.8	52.1	21.5	N.W.	1.47
December . .	32.6	51.6	9.6	50.6	18.2	N.W.	1.48
Winter . .	31.4	50.4	0.2	59.0	56.3	S.E.	4.18
Spring . .	42.5	72.9	28.9	45.4	64.4	N.W.	6.59
Summer . .	71.3	94 7	49.2	31.4	83.3	N.W.	2.04
Autumn . .	51.3	74.9	30.0	42.9	73.2	N.W.	4.13
Year . . .	49.5	......	......	41.6	277.2	N.W.	16.94

This table shows a period of observations extending from 1874 to 1884, inclusive.

This region has an exceptionally cool and equable climate, the seasonal changes in the temperature being so gradual

and the air so dry that neither the heat of summer nor the cold of winter produces the unpleasant effect that it otherwise might. There are very few high winds, and an entire absence of cyclones and hurricanes.

During the last few years Salt Lake City has grown from an old-fashioned village into a lovely modern city of 70,000 inhabitants, with paved streets and walks, an efficient sanitary system, a good electric street-car service, a perfect system of water-works, sewerage, etc.

Fine hotels, theatres, stores, and residences have taken the place of the old buildings. The bathing facilities have been greatly improved and are very fine. There is the "Salt Lake Hot Springs Sanitarium," to which the Sulphur Springs water is carried in pipes, and where all kinds of sulphur baths may be taken. There is also the "Salt Air Bathing Resort," one of the finest salt-water bathing resorts in the world.

For references in regard to boarding-houses, etc., refer to F. A. Harris, 734 Owen Street, Salt Lake City, and J. H. Bacon, Grand Hotel.

For out-of-door attractions there are those always found at an altitude resort, and hunting, fishing, salt-water bathing, etc.

The particular advantages claimed for this region as a health resort are the dryness and equability of the soil and temperature, the large amount of sunshine, and the absence of high winds. Coupled also with the climatic advantages offered the health-seeker in Utah, there are excellent opportunities for home-seekers and investors, especially to those who want a place where the business conditions are not only favorable, but where they can also enjoy while at work pure, wholesome air.

See also Vol. VII. TRANSACTIONS of this Association.

ISLANDS OF BERMUDA (ENGLISH).

Elevation, highest point of land on the Islands, 262 feet above high water the chief town, Hamilton, about 20 feet above sea-level.

The Bermuda Islands lie 700 miles southeast of New York

and about 600 miles from the nearest point on the American coast. They are about in the latitude of Charleston, S. C., and so are not subject to extreme heats, while the Gulf Stream, passing between them and the American Coast, protects them entirely from the cold winds and storms which visit even the most Southern of the United States in the winter months. Frost and snow are absolutely unknown in Bermuda.

The soil is composed entirely of a porous coral rock, which absorbs all rainfall at once; there are no fresh water-ponds, marshes, or damp places of any kind.

In summer the temperature hardly ever exceeds 87°, and in winter is never lower than 50°; and the temperature of the winter months is remarkably equable, with a daily variation of not more than 8° or 10°. The humidity is high, not far from 90°. For more than two-thirds of the year the days are bright and sunny.

For accommodations there are two large hotels, "The Hamilton" and "The Princess," both first class in every respect. There are also many private boarding-houses throughout the Islands, all kept by most respectable people, and the terms are very reasonable. Addresses of some of the boarding-houses in the town of Hamilton: A. Paschal, American House; W. Bradley, Windsor House; Miss F. Smith, Victoria Lodge; Miss Edgar, The Brunswick; Miss Bennett, Dorchester Lodge.

The facilities for enjoying outdoor life are abundant and varied. There are many miles of perfect coral roads and the drives are picturesque and delightful. There is unlimited scope for the enjoyment of riding, driving, bicycling, rowing, sailing, fishing, and bathing, and there are also numerous excursions to points of interest that can be made by both land and water.

The particular advantages claimed for this region as a health resort are its equable climate and temperature, and its freedom from malaria and fogs, which, with the picturesque beauty of its scenery and its unique departure in appearance from anything to be found elsewhere, makes it, in short, an ideal winter resort.

GENERAL INDEX.

VOLUMES I.–XI.

(Prepared by Dr. Guy Hinsdale.)

D indicates remarks in discussion of papers.
Roman numerals indicate volume of Transactions.